HUMAN IRIS PIGMENT*

I—A Concept of Individual Reactivity with Implications in Health and Disease

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". . . One's Eyes are what one is, one's mouth what one becomes. . ."

JOHN GALSWORTHY

Introduction

Hippocrates (430 B.C.) observed a correlation between body morphology and susceptibility to certain diseases and temperamental peculiarities. Many investigators followed, attempting to correlate constitutional diatheses with temperamental characteristics. It was not, however, until Kretschmer's publication of "Körperbau und Character" in 1925, that contemporary investigators became seriously interested in this field.

Sheldon, in his extensive work, attempted to link up the different body types with the three germinal layers in the embryo:

     a)   the ectoderm
     b)   the endoderm
     c)   the mesoderm

The body types representing these three factors correspond to Kretschmer's leptosomatics, pyknics and athletics.

Factorial analysis introduced the concept of two orthogonal factors as an efficient representation of the three Sheldonian components. Eysenck, (9) in his factorial analytical study of the human physique, deduced that since an embryological layer such as ectoderm, is concerned with the development of body organs, it would logically appear that the ectomorphic person should show measurable differences of the ectomorphic organs: teeth, ear, nose and eye, as compared with other types. Furthermore, he even predicted that "It should be possible to make detailed developmental studies on animals, possibly even including genetic changes, which might lead to a verification of this embryological hypothesis".

General Formulations

The eye is an outgrowth of the brain, readily available to observation. Embryologically it is related to the richly vascularized brain stem, basal ganglia, hypothalamus, thalami and the hypophysis. Clinically, particular significance is attached to the pigmented masses in these structures. Qualitative and/or quantitative pathological alterations of this pigment are associated with clinical syndromes such as Parkinson's Disease, Choreoathetosis, as well as the uncommon congenital (i.e. genetically determined) diseases. Pigment changes also occur in the brain in other diseases. For example, clearly defined neuropathological findings are described in Mongolism: brain stem sections reveal a complete absence of pigmentation in the substantia nigra. (1) Of further interest is the observation that there is no detectable alteration in the morphology of these tissues and their cell development is normal.

In addition to physical findings associated with diseases of metabolism, there may be noted structural deformities, mental deficiency, and other neurological symptoms associated with pathology at the base of the brain. A few of these diseases include: the childhood myopathies, Tuberous Sclerosis, Apert's Syndrome and the well-studied metabolic disorders of defective amino-acid metabolism in phenylpyruvic oligophrenia, defective carbohydrate metabolism in Von Gierke's disease, and the altered pigment metabolism of Hallervorden-Spatz's disease. (2) In mongols and cretins there are notable disorders of protein, lipid and carbohydrate metabolism. Their impaired carbohydrate metabolism is of particular interest(1), since even the administration of adrenalin does not evoke liver glycogenolysis. It is significant that amongst numerous other structural anomalies in mongols and cretins, the iris pigment is patchy in distribution (speckled) and may show evidence of anisochromiridia.

Modern thinking would suggest that the metabolic disorders are probably basically due to faulty enzyme metabolism, analogous to Garrod's classical biochemical-genetic study on human alkaptonuria. The opportunity to study iris pigment in patients with genetically determined metabolic disease is relatively infrequent, but most of those observed exhibit a light-colored iris. The relationship between iris pigment and congenital disease is well exemplified by albinism. In such patients, the enzyme tyrosinase is absent and hence they cannot synthesize pigments, a fact which probably accounts for their non-pigmented iris. Other clinical symptoms present are: inability to tolerate light, autonomic nervous system instability and other central nervous system disturbances, including a characteristic personality pattern.

Genetic Aspects

Iris pigment is genetically determined. Conventionally, blue eyes are considered as recessive to heavily pigmented dark eyes. The "mixed eyes" are heterozygous. However, this simple scheme is doubtless inadequate and many authorities consider that blue eyes have originated as a mutation from brown. (3)

At birth the appearance of the iris is usually non-specific and becomes established in early childhood. However, even in the newborn, different patterns of autonomic function, such as skin temperature, cardiac rate and respiratory rate have been reported. (4) Consistent and statistically validated physiological criteria were found, indicating an individual biological predisposition in randomly selected infants less than four days old. This observation is genetically significant and contains important physiological and clinical implications.

Biochemical Aspects

The amino-acid tyrosine is converted to melanin-like pigments in the presence of the enzyme tyrosinase and copper. Such pigments progressively increase in amount in the iris as we proceed from light blue to dark brown eyes, as illustrated on the iris pigment scale. Other substances, such as nor-epinephrine, on one hand, and adrenaline with adrenochrome on the other, are of considerable interest in relation to the iris pigment scale.

Morphology

The eye color varies from one person to another. This color difference is due principally to the varying amounts of a melanin-like substance deposited in the iris. Emphasis must be directed here toward the fact that iris pigment is different from cutaneous or hair pigments. Among various other factors are qualitative differences in the iris pigments, the pattern of deposition of these pigments within the iris, especially in relationship to the pupil, the integrity
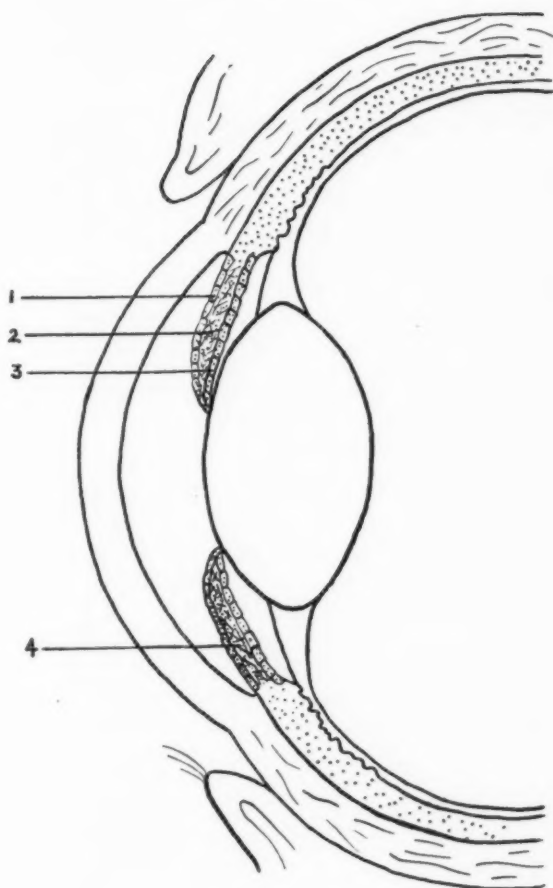
Fig. 1—Schematic representation of the relevant components of the human iris:

The iris in the brown-eyed subject is composed essentially of:

1. Anterior ciliary epithelium
2. Stroma
3. Posterior epithelium
4. Extensions of the ciliary smooth muscle

In brown-eyed subjects; pigment granules are noted in all the above-designated essential components of the iris. In descending order on the numerical iris pigment scale there is a quantitative decrease in the amount of these pigments. At the blue-eyed end of the scale, pigment granules are minimal in amount and the anterior ciliary epithelium is incomplete, deficient in parts, or absent.

of the anterior ciliary epithelium membrane, the thickness of the stroma of the iris and the color, quality and quantity of the pigment present therein. These factors are also genetically determined, but may be altered by disease (local or systemic). An additional modifying influence is to be found in the refraction of light from the pigmented chorioid and its numerous blood vessels, as seen by the observer.

The Eye Scale

In the author's concept, the various iris colors may be presented as a continuum analogous to the spectrum, as shown in the Color Plate. These colors range from the extreme absence of pigment at one end of the scale, as in the albino (not illustrated), through increasing amounts of visible iris pigment toward the opposite end of the scale, namely, the black iris with its extremely rich pigment content.

The maintenance of a relatively constant eye color for any given individual over a relatively long period of time is probably a manifestation of biochemical and/or neurohumoral processes. Experimental data available are inconclusive concerning the possibility that the pars intermedia of the hypophysis may regulate this mechanism. (5)

The iris, being substantially equipped with blood vessels, is readily accessible to circulating neurohumoral agents. The interruption of the blood supply to the iris by pathological lesions has been shown to be associated with depigmentation of the resultant ischemic portions. (6) Another factor is that the iris delimits the size of the pupil which is constantly changing either in association with adjustment to light intensity, or as a participant in the complex neurochemical reactivity which is characteristic of the autonomic nervous system and its related hypothalamic endocrine system. (7)

It is suggested that the iris pigment scale provides a basis for estimating the specific responsivity of the individual to a variety of pharmacodynamic agents such as insulin, reserpine, serotonin, lysergic acid and chlorpromazine, to mention but a few.

Investigational Aspects

The author, over a period of many years, has endeavoured to assess carefully the visible iris pigment. This, he believes, may serve as a reliable guide to many of the physiological as well as psychological characteristics of individuals observed.

Numerous correlative studies, both clinical and laboratory, are currently under way. These encroach upon many medical disciplines, namely: metabolism, endocrinology and cerebrovascular physiology (8) and psychiatry, to enumerate but a few. Among the many laboratory techniques relevant to detailed investigations in this regard are: spectrophotometric and microphotographic analysis of the iris pigment, fractionation of a variety of blood constituents by ultracentrifugation, and paper chromatography. Radioactive isotopes, it is anticipated, will assist in further analysis of the type, quantity and origin of the iris pigments, as well as their relationship to certain neurohumoral substances. In addition, the association between the individual's iris pigment and his basic personality structure, may emerge from factorial analysis (9).

Psychiatric Aspects

The concept of the correlation of iris pigment with temperament, (10) provides a new frame of reference as a single, morphological factor, genetically determined and expressed in linear form in the iris pigment spectrum.

As already suggested, there is tentative clinical evidence that a relative absence of a melanin-like substance and its metabolic precursors is associated with the neuropathological processes in genetically determined mental deficiency. Investigative aspects in this connection would include the clinical study of the characteristic utilisation by such patients of cholesterol, phenyl-alanine and its derivatives, tyrosine and tyrosinase, among other substances.
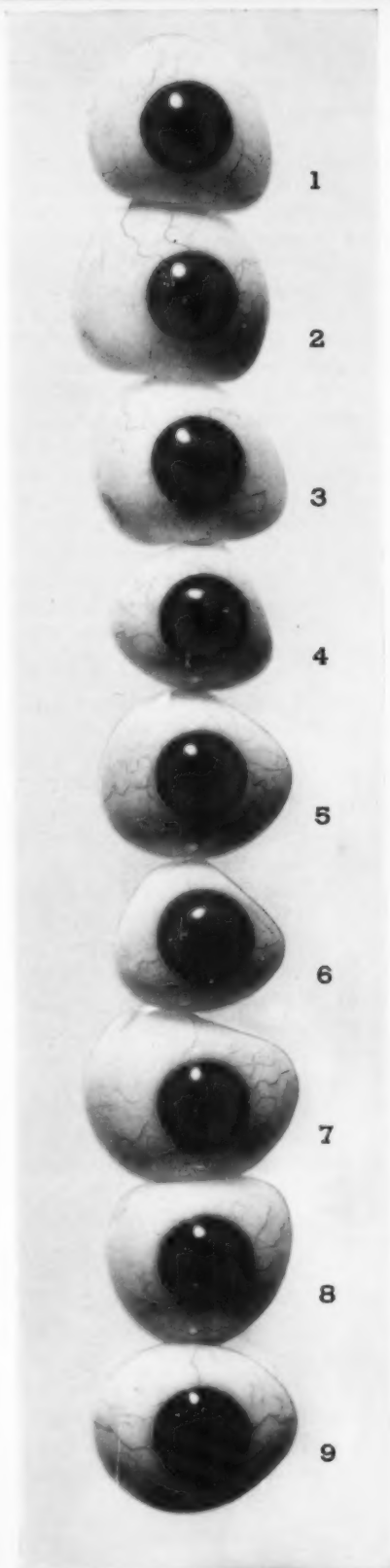
THE AUTHOR'S
IRIS PIGMENT SCALE

9 artificial eyes have been arbitrarily selected to introduce the concept of a spectrum-like continuum of iris pigmentation.

Nos. 1-3, with minimal visible iris pigment deposition appear essentially blue in color.

Nos. 4-6 exhibit progressively increasing visible iris pigment.

Nos. 7-9 with increasingly more abundant iris pigment deposition, range in appearance from brown to extreme black.

It must be emphasized that there is an almost infinite range of colors, as regards the human iris. All eyes are basically blue, and their apparent color differences are due to the varying quantity and distribution of the melanin-like pigment obscuring the blue background.

In the interest of clarity only 9 representative eyes were selected to delineate the iris color continuum.
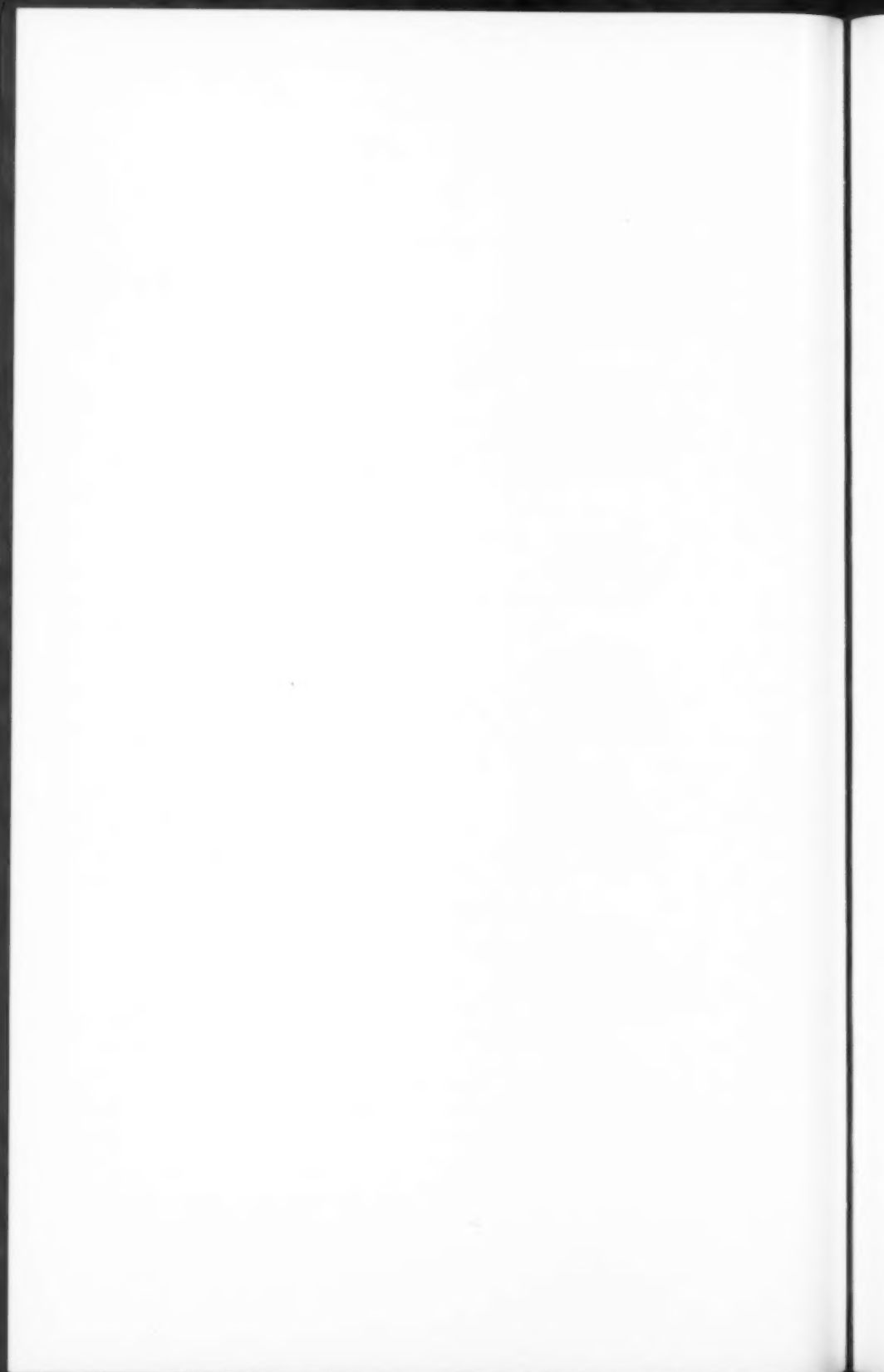
The iris pigment scale is of particular relevance in our endeavour to investigate the schizophrenic process. In the author's experience, a significant percentage of schizophrenic patients have light-colored eyes in the intermediate zone of the iris pigment scale. As an interesting comment, hospitalised individuals of Finnish origin, if diagnosed schizophrenic, are found to be essentially in the paranoid category. (11) Significantly enough, Finns, like most other Northerners, have predominantly light-coloured eyes. Patients with variable iris pigmentation (in the intermediate zone of the iris pigment spectrum) are a mixed variable and inconsistent group, exhibiting clinical symptoms ranging from suspiciousness, jealousy, thought dissociation, outbursts of temper and hostile-aggressive, impulsive behaviour, at the lighter part of the intermediate zone of the scale, to indifference, inertia, lack of motivation, marked emotional flattening and inaccessibility to communication, with inappropriate behavioural responses, at the darker part of the intermediate zone of the scale. It should be noted that, from time to time, patients in the intermediate group may exhibit great variability and unpredictability of the intensity and qualitative clinical manifestations of their schizophrenic processes. It may well be that this fluctuating clinical syndrome is, at the present state of our knowledge, designated as the "schizoaffective" group.

Physiological Correlations

Some of the implications of the concept are illustrated by certain clinical observations made under standard conditions. Repeated recordings were made of the pulse rate, pulse pressure, respiratory rate and oral temperature of 166 normotensive individuals. Their ages ranged from 20-40 years and their brachial artery diastolic pressure did not exceed 90mm Hg. Together they represented three groups in relation to the iris pigment spectrum.

It should be emphasized that a group of 62 subjects occupied the intermediate range on the eye scale and presented extremely variable physiological reactions. Even biochemical data, such as blood sugars, obtained from them, varied significantly from time to time, and from day to day. Finally, these subjects were also noted to exhibit a variable and unpredictable temperament.

Now, at the extremes of the iris pigment scale healthy blue-eyed individuals exhibited significant differences in their pulse pressure, pulse rate, respiratory rate and oral temperature, as compared with the brown-eyed subjects. The above tests were part of routine pre-employment medical examinations. At the blue-eyed end of the scale it was noted that the pulse pressure range was 14 to 26 ± 8 mm Hg. The pulse rate varied from 80 to 94 per minute. The respiratory rate was approximately 18 to 22 per minute. The range of oral temperature was from 98.2 to 99.8F. By contrast, at the brown-eyed end of the scale, the pulse pressure range was 30 to 60 mm Hg. The pulse rate varied from 60 to 72 per minute. The respiratory rate was approximately 12 to 14 per minute. The range of oral temperature was from 96.1 to 98.4F.

Significantly, equally contrasting temperamental characteristics were observed in the above described groups of individuals. (10).

In addition, a group of 17 subjects presented data which were associated with systemic diseases.

Clearly, the above basic physiological data concerning all the reported subjects and obtained under standard conditions are quite variable. This variability correlated well with the position of the subject on the iris pigment scale.

It is the author's opinion that the selective reactivity of each individual to his environment is genetically determined, and therefore predictable, at least in part, and is represented in the specific appearance of the iris.

Summary and Conclusions

1. Assessment of the visible iris pigments for a given individual may serve as a reliable guide to many of his physiological as well as psychological characteristics.

2. The author's iris pigment scale which dynamically presents the iris colors from blue to deeply pigmented black is arranged in a spectrum-like continuum. This scale is presented in relation to human health and disease for the first time.

3. This frame of reference provides for a genetically determined guide to certain aspects of the basic selective reactivity of each individual to his environment in relation to the specific appearance of the iris pigment.

4. It is felt that the principle of individual reactivity may facilitate a more appropriate and efficient application and use of those chemical agents and therapeutic procedures already available.

5. Some aspects of the application of the iris pigment scale, as a new frame of reference, to the normal variants of temperament, the genetically determined mental deficiency and the schizophrenic process, have been delineated.

Résumé

L'auteur présente pour la première fois une échelle quantitative du pigment iridiel visible en constant que l'inspection du pigment iridiel sert à guider la prédiction de la réactivité sélectve physiologique et psychiatrique de la personne humaine. L'on suggère que cette échelle jète de la lumière sur la variabilité, peut-être génétique, de la réponse individuelle aux agents pharmacolologiques, tel que l'insulin, la réserpine, la sérotonin, le largactil et l'acide lysergique. Selon l'auteur, l'emploi de cette échelle peut s'étendre à éclaireir des aspects importants de la variation du tempérament humain ainsi que du processus schizophrénique.

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HUMAN IRIS PIGMENT

II—Factors in Schizophrenia*

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The purpose of this investigation was to ascertain whether any correlation exists between one, or more, constitutional and/or morphological factors, and the schizophrenic process.

Clinical Material

448 Patients in Verdun Protestant Hospital were investigated of which 255 were unselected schizophrenics and 193 were unselected non-schizophrenics. Constitutional investigations were carried out without prior knowledge of the clinical diagnosis which was established independently by the medical staff of the above hospital.

Methods and Procedures

The eye color of each patient was assessed in relation to the Iris Pigment Scale.(2). Other investigations of each patient included height and weight measurements, expressed as a ponderal index of height/weight ratio, anthropometric measurements of seventeen body diameters (1) and I.B. (index of body build) computations.(3). Hair and skin colors were assessed by means of graded scales ranging from light, through intermediate, to dark.

Cranial artery vasculographs (4) were obtained on 32 unselected schizophrenic patients of various clinical sub-diagnostic categories.
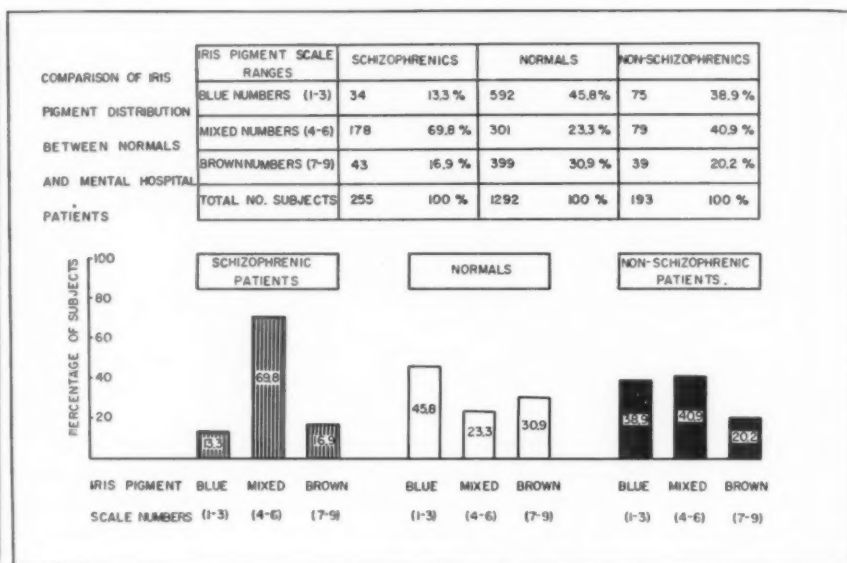
In the absence of any information concerning the distribution of eye color ranges in the normal population, a survey of 1292 school children was made in this connection. (See table).

Results

The eye color ranges showed interesting trends. (See Table). The percentage of hospitalized schizophrenic patients in the blue iris pigment range was less than one third of the percentage of the subjects, in the same iris pigment range, in the group of school children examined. The percentage of hospitalized schizophrenic patients in the mixed iris pigment range was about three times the percentage of the subjects, in the same iris pigment range, in the group of school children examined. The percentage of hospitalized schizophrenic patients in the brown iris pigment range was slightly more than one half the percentage of the subjects, in the same iris pigment range, in the group of school children examined.

Discriminant Function Analysis of somatometric factors and other morphological data obtained was carried out, and will be reported in a separate communication. The analysis of the variants table showed no significant somatometric difference between investigated schizophrenic and non-schizophrenic patients. This appears to confirm the findings of Lasker, and also of Bellak and Holt. (5). The skin color was also found to be non-significant as a factor in this study. Hair, being subject to loss and change in color due to ageing, was considered to be an unreliable morphological index.

COMPARISON OF IRIS PIGMENT DISTRIBUTION BETWEEN NORMALS AND MENTAL HOSPITAL PATIENTS

IRIS PIGMENT SCALE RANGES	SCHIZOPHRENICS		NORMALS		NON-SCHIZOPHRENICS	
BLUE NUMBERS (1-3)	34	13.3 %	592	45.8%	75	38.9 %
MIXED NUMBERS (4-6)	178	69.8 %	301	23.3 %	79	40.9 %
BROWN NUMBERS (7-9)	43	16.9 %	399	30.9 %	39	20.2 %
TOTAL NO. SUBJECTS	255	100 %	1292	100 %	193	100 %

SCHIZOPHRENIC PATIENTS — NORMALS — NON-SCHIZOPHRENIC PATIENTS. PERCENTAGE OF SUBJECTS. IRIS PIGMENT SCALE NUMBERS BLUE (1-3) MIXED (4-6) BROWN (7-9).

The data obtained by cranial artery vasculographs on the schizophrenic patients is under study at present, and although further investigations are manifestly necessary, it is already evident, that there is correlation with the Iris Pigment Scale (2) (6).

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MENTAL RETARDATION
A Review of Mental Health Implications*
By LEONARD J. DUHL, M.D.[1]

Most of us are now aware that mental retardation constitutes one of the major medical and social dilemmas of our times. Because you are regularly confronted with questions concerning the nature of this problem and what to do about it, I am sure I don't have to make an appeal for your interest. Actually, the parents of the mentally retarded children have probably seen to it. They have been more and more vocal in their demands that a part of our operating budgets and future plans be concerned with their children. Along with these demands have been the more recent ones of those professional workers who have recognized the potentialities in this field. They, along with the parents, are insisting that the pessimism about the retarded during the last 20-30 years should be lifted.

Some of the hard facts, upon which our future plans will depend, need examination. Obviously there are no ready made answers.

It seems to me that the first step is to take a thoughtful look at the meaning behind the words "mentally retarded." First, there must be a consensus as to definitions, who are the mentally retarded in terms of number afflicted and their degree of intellectual deficit. Secondly, what are the needs, and services, for the nation's mentally retarded population? Thirdly, what promise does research offer, and in what investigative fields can we anticipate the future breakthrough and advances.

To take a first look at the dimensions of the problem, the size and scope of the disorder must be viewed. This unfortunately is most difficult since we have never clearly defined what is meant by mental retardation. During a recent conference held by the Josiah Macy, Jr. Foundation on mental retardation experts offered at least a dozen different definitions. This approach to definition is not unique. Time and time again both at meetings and in the literature definitions are geared to the prime concerns and individual orientation of the definer. Such a lack of uniformity in definition is understandable. A definition that is broad enough to include all the different points of view would become relatively meaningless because of its diffuseness. Here is one recently advanced, "A mentally retarded person is an individual who according to professional evaluative disciplines and criteria, has failed to demonstrate his ability to live up to expectations in the intellectual and social spheres when he is compared with those of his chronological age." Another is "The mentally retarded include all persons who have a condition, in which the etiology is organic or non-organic but always exhibits a deficit in the intellectual spheres." Some medical personnel consider retardation to include only those persons who have the physical stigma associated with intellectual impairment. It is this group to which the term mental deficiency seems to have been attached — leaving mental retardation as the more inclusive term. The definition can be expanded to include the retardation of the superior and normal child who is not operating at his intellectual capacity.

Each of these many definitions is based on a functioning deficit. In each, the focus of the deficit is primarily intellectual despite the fact that the actual disorder may be in fact psychological. The definitions used have a circular

quality since they are efforts of the evaluation to define the problems of the retarded and not the basic disorder. In the field of education, for example, the I.Q. has been found to be the best single predictor of school performance; however, neither I.Q. nor school performance actually predicts non-school or post-school achievements.

These various definitions by their circular character obscure the real nature of retardation. I believe we now have reason to look at retardation not as a disease entity in itself but more properly as a condition seen in many different kinds of disorders which may or may not enter into the retardation picture. There is now a large body of evidence that affirms that these conditions result from congenital, genetic, developmental or other physical influences, as well as psychological and social conditions. As a result of acquiring more knowledge in the definitive etiology it will become easier to diagnose the true origins. It may become easier to differentiate the retardation caused by physical, psychological, educational and cultural conditions. For example, the physical conditions might be traced to nutritional, endocrinal, neural or a variety of such factors, pre- or post-natally. The psychological diagnosis may reveal the conditions as a consequence of some interference in normal personality development such as would result from maternal deprivation. Sub-standard educational practices arising from differences in teacher qualifications and regional expectations in educational attainment quite obviously affect the child's intellectual performance. One more item which must not be overlooked is the inequity arising from differences in family background which do not observe or emphasize the prevailing cultural attitudes toward learning.

Thus, these multiple and complex factors make it extremely difficult to make any exact determination of the prevalence of retardation. Simply as a device (based on some evidence) many of us for administrative reasons have come to use a figure of 3-3.5% of the 0-18 population as the known retarded. Simple arithmetic leads to a figure of 1,500,000 children who are retarded and an estimated 4,500,000 retarded in the population of U.S.A. This, then, and especially if we consider all the family members involved, as well as the retarded themselves, makes this an enormous problem.

That the problem extends itself to the community at large is pointed up by the fact that only 150,000 persons, most of whom are severely and organically retarded, are institutionalized in the United States. This leaves the bulk of the retarded living in our communities. Of those children who remain in the communities with their families, less than 130,000 are now reported attending special classes. Where are the remainder? Many are in regular classes but usually behind their grade. Many are out of school; unacceptable to the school systems. A large number remain unaccountable.

Ernest Gruenberg of the Milbank Fund has recently made a graphic presentation relating to the prevalence of retardation. In a curve developed from age and prevalence rates he shows, that no matter what definition of retardation is used, the prevalence rate varies with age. Between 0 and 5 the prevalence is constantly low; from 5 years the prevalence rises to a peak at the age of 13, after which it slowly descends. This curve gives rise to many speculations. Why the peak age at 13? Is it the demands of our school system and the attitudes of our culture toward the 13 year olds? Does the drop in prevalence, after 13, reflect the diminishing concern of our society for the individual who does not exhibit expected abstract intellectual ability and promise of success in adult life? Or does society begin to make use of these people's other abilities, and absorb them, thus losing their identity as retarded. Incidentally, the curve for girls is similar but the prevalence is lower. Does it also reflect similar yet

less stringent cultural values for women? These are just a few of the questions which require much study and evaluation. The prevalence curve of the more severe and organically retarded, interestingly enough, is quite different and less responsive to these multiple factors and does not show the unusual peak that Gruenberg has described. It is, therefore, important to note that despite the basic neurological quality of some cases, most retardation has psycho-social determinants, and as will be pointed out later, even with an organic basis, it has psycho-social complications. It is for these reasons that mental retardation is in a large part a mental health matter.

To leave the problems of definition and prevalence, I would like to turn now to the problems of needs, services, and program planning. Though there is a tremendous "head of steam" built up throughout the country for such programs, we are faced with decisions relating to the best course of action in our planning. In making these decisions we encounter some definite and clear problems.

Briefly and pointedly, it can be stated that there is an inadequacy in both the quality and quantity of personnel needed to meet the needs of the retarded from either a service or research point of view. This lack does not confine itself to the medical and allied fields alone but is perhaps even more evident in the field of education.

Service-wise, diagnostic services are sorely deficient. Few areas have centers where children can be evaluated and diagnosed adequately. These areas have even fewer clinics to meet the long-term needs of the retarded and their families. Neither specialized clinics for the retarded, nor the broader pediatric or mental health clinics have been able to meet the needs. Private physicians have not been able to escape criticism. They have often been the butt of much parental hostility for their lack of help to the individual case.

How then, can these conditions be rectified and where does the responsibility lie for correcting this situation? Not in the hands of the practitioners or clinic workers alone. For example, in the case of physicians, too often their training sadly neglects any information in this area. Frequently, when training is offered, either in medical school or in specialty training, many choose to learn "more important things." Nevertheless pressure for clinics specializing in diagnosis and care of the retarded is demanding individuals of competence. Many of us become quite concerned when specialized clinics are demanded because the tendency for splintering into subspecialties is great. The dangers of this splintering becomes self-evident. On the other hand, the personnel of established pediatric and mental health clinics are at present usually neither trained, nor desirous of dealing with the problem. The retarded by many clinics' definition are neither "good cases" nor "interesting ones." For the time being the job may be a two-way one of both sponsoring and developing specialized services and educating and redirecting the emphasis of the broader clinics.

The need for trained personnel, and the question as to specialized services is similarly evident when we look into other treatment programs, rehabilitative services and even educational activities. Questions in much the same vein are being asked of the institutions. Should the institutions be concerned with the mentally retarded alone or should they broaden their services.

Personnel problems in all agencies, institutions and clinics are somewhat similar. Many personnel enter the field by accident, some because they need a job, and very few, until lately, by any conscious design. We can conclude that professional training programs are required. And at the same time there is a need for continuous in-service courses to bring personnel up to date.

Short training institutes which the National Institute of Mental Health has supported have been widely attended with much reported enthusiasm and interest. These have been held on a regional basis and have involved medical, psychological, rehabilitative, educational, and other personnel responsible for diagnosis, care, treatment, and training of the retarded. The attendance and enthusiasm that these institutes have had should be a reflection of the total need that is present.

Are there similar needs for longer five to six week refresher courses to be given on a State or regional basis? Such courses might be considered as opportunities for the mental health clinic worker, for example, to gain professional competence in a new area, and at the same time help him to incorporate services to the retarded into his more general clinic.

These institutes, either short or long term are geared to persons already professionally trained and do not claim to give education where it is also sorely needed—as part of the original basic professional education received. Sadly, few training centers are either equipped or desirous of being responsble for such education.

Recently, there has been increasing awareness on the part of pediatricians of the need for such training. Psychiatrists are still relatively uninterested and continue to receive limited, if any, training in this area.

Psychologists who several decades ago played an important role in both research and service for the retarded have generally been similarly negligent in recent years. Yet a small number have at the same time been more active than their medical brothers. There are a few centers, primarily educational in nature, which have programs to train their psychologists for work in mental retardation. However, in no way is this adequate to the need. In 1954 the NIMH made a grant to the Psychology Department of George Peabody Teachers College in Nashville, Tennessee, for the training of psychologists with research emphasis in mental retardation. Under the supervision of Nicholas Hobbs and Lloyd Dunn, broad training in psychological disciplines is available, with emphasis on both service and research. Samuel Kirk, at the Institute for Exceptional Children, in Urbana, Illinois, has trained psychologists who have been immediately utilized by this field with its insatiable appetite for well trained persons.

In the field of education, the lack of trained teachers of the retarded is compounded by the more general inadequate number of school teachers. Though we can point to the inadequacy of the educators trained in special education, we can also point to the lack of training opportunities. Though courses in mental retardation are available in about 40 schools of education, an extremely small number are equipped for truly comprehensive training.

Despite the tremendous bottleneck personnel-wise, there have been new guidelines developed from recent research and from service programs that are leading to very heartening improved methods of care.

Diagnosis seems to be both a difficult problem and one fraught with emotional difficulties. Repeatedly, parents, including those who have financial means and can buy services, have become frustrated and increasingly tense due to visit after visit from office to office and clinic to clinic. To state that there is a need for a careful comprehensive evaluation sounds trite, and yet by its reported neglect in all but a few centers, it needs reemphasis. The examination must include a neurological, psychological, and general medical evaluation with careful analysis of the familial, cultural, educational, economic, and other social factors.

During diagnostic evaluation, and at the moment of diagnosis, the family needs much help in both understanding and support. Disposition, either through institutionalization or through home care, is filled with tension and distress. Families need guidance and help in working through their feelings. Too often families have had suggested to them immediate institutionalization with resulting guilt, ambivalence, and rejection. Similarly, the moderately or minimally retarded, though not severely incapacited enough to be institutionalized, may be labelled by I.Q. batteries or other diagnostic tests and, in many ways, exiled from the realms of the normal. With any diagnosis goes a stigma, extremely difficult to lift, that haunts and hinders cure and progress. Administratively and practically such labels and diagnoses have to be made, of course. Nevertheless, careful consideration should be given to the diagnostic criteria required. Similarly, ways must be found to make the public much more aware and show compassion and acceptance of individual differences as evidenced in retardation. Therefore, though, there is need for a thorough diagnosis and follow-up, the psychological and sociological needs of the family seem almost of prime importance; and in very few clinics, are these adequately met. To meet these needs many of the accepted and well known concepts of the child guidance clinics should be utilized in the work with the retarded. It is in this area that the well trained mental health worker has much to offer to both other professionals and the family.

Some institutions provide only minimal medical care and supervision or consultation. A few attest to the fact that even minimal humanitarian and medical care is lacking. Some of these institutions offer feeble excuses—there are no personnel; the States, localities and public ignore them. In general many are second class institutions. But in my mind there is no excuse for the conditions that some of them are in. In stating this I am not impugning the better institutions, and there are some. A few can even serve as models. I am talking about the large majority. They require much thinking and planning of their future roles before they can serve their real purposes.

The typical institution is isolated—both professionally and geographically. Professional persons in them have in many instances lost touch with their colleagues in either medical or university centres. They are unable to attract professionally qualified persons, to train those they have. Isolated they stand as receptacles for the society's debris rather than serving as active centres for human betterment.

The Pacific State Hospital in Pomona, California has a program under the leadership of George Tarjan which can be pointed to with pride. Pacific State Hospital now has a full psychiatric residency program. It has a large team of both psychologists and social workers. Cooperation with nearby universities has led to research and improved training. Assumption of responsibility has resulted in clinical services aimed towards helping cases remain in the community except when hospitalization is absolutely necessary. Their clinic program includes a general mental health clinic. Truly this institution has to a large extent assumed a role of community responsibility.

To complete this review of the problems of service, I want to call your attention to the fact that pilot projects and demonstration units have been set up in many parts of the country and especially, in the Northeast, which has excellent clinics for diagnosis and evaluation, home care and rehabilitation.

Along with a desire to give better service comes a need for more knowledge.

Research is the third matter that I wish to discuss. There is new knowledge which portends great advances in the next decade, but many questions surround

the attack. Where is research needed; or better yet, where is it needed first? What are the priorities? In moving from etiology to problems of care and treatment come endless questions. Recognizing this, the National Association for Retarded Children with the guidance of Richard Masland and Seymour Sarason has begun a two-year survey of research leads into the etiology of retardation. Both by a survey of the literature of retardation and allied fields and by visiting university centres, leads in both medical and psycho-social aspects of retardation will be sought. Already from fields as diverse as protein research and schizophrenia have come ideas and concepts worth further exploration. Since this survey has begun we at the Institute have noted that many persons have become aware of how their work relates to retardation, and how the field of retardation offers challenge for study. There now is an increasing number of requests for grants and information coming to the National Institute of Health. Independently, a Nobel Prize winner in chemistry, Dr. Linus Pauling, recently announced his intention of working in this field for the next 5 to 10 years. This work will be a cooperative venture of Linus Pauling's group at California Institute of Technology with George Tarjan at Pacific State Hospital.

Research relating to prevention has of this date been extremely profitable. Pasamanick and Lilienfeld's studies of the interrelationship of pregnancy difficulties and subsequent retardation have recently been published. In a study of the mental retarded and a series of controls (the controls being the next recorded hospital birth) revealed a marked incidence of pregnancy difficulties such as eclampsia, hypertension, pernicious vomiting, etc., in the mothers of the subsequently retarded children as compared to the normal controls. Similarly, nutrition studies of both pregnancy and early childhood years offer much hope. With improved diet associated with more careful public education programs, the problems of minimal deprivations which may have an etiological significance can, in part, be dealt with. One might even hazard a guess that such nutritional deprivations not only have an effect on physical growth but also have an effect on intellectual competence. If so, not only will this knowledge aid in the prevention of retardation but also in understanding problems of intelligence in the "normal child." Maternal and child health programs which have traditionally focused on this area need both increased support and broadened scope.

H. V. Brondsted from Copenhagen recently reported in the *Bulletin of Atomic Scientists* his impressions that stress during pregnancy, either psychological or physical, could effect the hormonal system enough to interfere with normal foetal development. The old wives' tales of pregnancy may indeed have scientific credence.

Phenylpyruvic oligophrenia, a genetically linked disorder, has recently been shown to be the result of a disturbed enzyme system which is controlled by a single gene. The disturbance of the enzyme results in a build up of phenylalanine in the blood leading to, among other secondary disturbances, the retardation of intelligence. Dealing with this disorder by dietary means, Armstrong in Utah has reported marked improvements in several cases. Further studies of the enzyme system and the genetic involvement may lead eventually to the development of replacement enzyme therapy. Another disturbance, galactosemia, has recently been discovered to have a similar etiology which can be controlled by diet. Research workers feel that work with these disorders offers many leads for further studies of the other retardations.

In mentioning some of these most recent studies, I have attempted to point out some of the interesting work relating ultimately to prevention. However, if

we work back into history of medicine we can see many conditions which can develop retardation which have been either conquered or radically curbed. Lemkau, in the past and more recently Warkany from the University of Cincinnati, recently presented a list of conditions that cause retardation which we have some knowledge about. Thus, in part, we have been able to cut down the incidence of retardation by preventive techniques. A modified and shortened list follows:

meningitis, lead and other similar poisonings, nutritional deficiencies, pregnancy complications, syphilis, German measles, obstetrical procedures in general, RH factor, radiation, endocrine disorders such as cretinism, hypothyroidism, hypoglycemis, hypocalcemia, subdural hematoma, phenylpyruvic oligophrenia, galactosemia, cranio-stenosis, sucrosuria, maternal deprivation, genetic counseling, cousin marriage, maternal age, kwashiorkor.

After reading this list of accomplishments, it is obvious that it is still but a drop in the bucket.

Besides the question of etiology, many others require attention. The problems of the family, the parents and other siblings, home and institutional management, and care; new diagnostic techniques, educational methodology and the like, all need study. No area is of more immediate importance than epidemiology and nomenclature.

Recognizing the broad needs in the areas of research, training, and program development, the NIMH has recently awarded a grant of $230,000 to the American Association on Mental Deficiency. To this committee and its newly appointed executive director, Dr. Robert Myers, presently with the New Jersey Department of Institutions, goes the responsibility for developing guidelines in these areas. Through their committees and surveys, and work in conjunction with the Joint Commission of Mental Health, the next few years should lead to increasing awareness and focus in this field. Along with this work, their journal through newly incorporated research abstracts and yearly reviews, will serve as a clearinghouse of available knowledge.

The U.S. Department of Health, Education, and Welfare has similarly attempted to aid in many areas. Recently after one year of work a comprehensive and coordinated Department-wide program has developed. For the coming year the Department's budget is approximately $4\frac{1}{2}$ million dollars. Plans for assistance to States and local communities in making available services such as diagnosis, therapy, social service, rehabilitation, education, the training of personnel and research, have been developed. These programs will increase the consultation, training, and research support available. The focus of DHEW thinking has been that a comprehensive program must be developed along a multiplicity of lines. The interdependence of medical and educational programs in the care and treatment of the retarded necessitates support for all areas. Education, for example, needs teachers, programs and research. Their programs despite the need for medical research and care, are the backbones of all the services to the retarded. They thus need support of all kinds. At the same time, for the professional programs in retardation to improve and to achieve their maximum effectiveness, they must be a part of improved schools' mental health and child health programs which form the true base for any specialized work in retardation.

Mental retardation offers us all a challenge. We are challenged, not only by the guilt of inadequate services and personnel, but also by the promise of a new era where treatment rather than custody comes to the fore, and preventive

programs are ever present. The promotion of intellectual health as a part of mental health is a tremendous challenge to our society, not only for its sickest members, but for the total population. This is an area of great need—which requires comprehensive planning.

Résumé

La débilité mentale est un des grands problèmes médicaux et sociaux de notre époque. Il est difficile d'en connaître l'étendu à cause de la diversité des définitions. Bien que $3\frac{1}{2}$ pour cent des enfants soient considérés arriérés, ce problème semble constituer davantage une préoccupation sociale que médicale. Que l'aspect social soit important à cause de sa fréquence est établi par l'augmentation du taux durant les années scolaires, période des plus grands espoirs, jusqu'à un sommet vers l'âge de 13 ou 14 ans. C'est pourquoi l'arriération mentale a un aspect social aussi bien que biologique et psychologique.

La qualité et la quantité du personnel requis pour la recherche et le soin de ces malades sont tout à fait inadéquates. Ni les cliniques spécialisées, ni les départements de psychiatrie des cliniques pédiatriques n'ont été ou bien désireux, ou en mesure de faire face à ces besoins. L'entrainement des médecins, ainsi que des professionnels des autres disciplines, néglige habituellement d'attribuer une attention suffisante au problème des arriérés. Ce besoin fut comblé, en partie seulement, par des instituts à entrainement spécialisé et des cours de rafraîchissement. Cependant, il y a un grand besoin d'un personnel entrainé universitaire dans toutes les disciplines. Il existe un tel programme d'entrainement pour psychologues avec accent sur la recherche dans le domaine da la débilité mentale au Peabody Teachers College, à Nashville, Tennessee. Les écoles, bien qu'offrant un minimum de cours, sont loin d'être adéquates.

En dépit de la rareté du personnel, il y eut quelque amélioration dans l'évaluation clinique, le diagnostic et les recommandations thérapeutiques. L'aide aux familles se révéla très importante. La majorité des institutions sont de seconde classe bien que quelques-unes aient montré la voie dans les programmes d'assistance et comme centres de recherche et d'entrainement.

Les recherches dans les sciences de base se sont intensifiées. De plus en plus on s'intéresse au problème de la débilité mentale. Des études sur les difficultés de la grossesse produisant une débilité mentale subséquente, sur la nutrition, la génétique, les enzymes sont autant de sentiers vers une prévention efficace. L'Association Nationale des Enfants Arriérés, sous la direction de Richard Masland et Seymour Sarason, a assumé la tâche de colliger nos connaissances sur l'étiologie. L'Association Américaine de Débilité Mentale, favorisée d'un octroi de $230,000 de l'Institut National d'Hygiène Mentale, se propose de tracer des directives de recherche, d'entrainement, d'assistance et d'incorporer dans son journal des résumés d'articles et des revisions annuelles.

Divers états, et diverses agences nationales ont dirigé leur attention sur ce problème. A l'heure actuelle, la débilité mentale constitue un défi, non seulement à cause de l'insuffisance des soins et de la rareté du personnel, mais aussi à cause du fait que nous vivons une ère où le traitement et le prévention remplacent les attitudes simplement asilaires.

FACTORS INFLUENCING FIRST ADMISSION RATES TO CANADIAN MENTAL HOSPITALS

1. AN ANALYSIS OF TRENDS, 1932-1953.
(BY AGE, SEX, DIAGNOSIS AND METHODS OF ADMISSION)

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A. Introduction

There are three general methods by which medical knowledge may advance, which are not mutually exclusive but complementary to each other: (i) the (intensive) clinical study of the individual patient, (ii) laboratory experiment, (iii) the (extensive) epidemiological approach through field and statistical study of disease as a mass phenomenon of groups of people (Gordon et al., 1952). Classically, epidemiological methods of investigation were confined to the study of epidemic infectious diseases, but of recent years they have also been applied to the investigation of such disorders as cancer (Stocks, 1947), accidents (Gordon, 1949) and pellagra (Gordon and LeRiche, 1950).

At the 1949 annual conference of the Milbank Memorial Fund, Felix (1950) outlined the development of modern concepts of epidemiology — from "the science of epidemics" (Stallybrass) through "the natural history of diseases" (Welch) to Hirsch's definition as "the science which gives (i) a picture of the occurrence, distribution, and types of diseases of mankind in distant epochs of time and at various points on the earth's surface, and (ii) will render an account of the relation of these diseases to the external conditions surrounding the individual and determining his manner of life."

Gordon (1950) epitomised this definition in his concept of epidemiology as medical ecology. Hare (1952), in discussing the influence of environmental factors on the distribution, development and variation of mental disorders, entitled his dissertation "the ecology of mental disease". However, Gordon et al. (1952) have amplified on the relationship of these terms as follows: "Ecology is a biologic and social discipline concerned with the general phenomena of mutual relationships between living organisms and their reaction to animate and inanimate surroundings. That part of human ecology relating to health and disease is medical ecology, and medical ecology as it concern communities of people is epidemiology."

Elkind wrote on the epidemiology of mental disease as long ago as 1927, and numerous contributions have already been made to this field by members of various professions, so that Gruenberg (1950) was able to collect a bibliography of 362 relevant items—which he regarded as in no way complete. There has been a tendency for psychiatrists, public health workers and social scientists to work independently, but of recent years there has been increasing interdisciplinary communication and cooperation.

Among basic problems to which answers are still being sought are the following: (i) to what extent may mental disorders result from the complexities of civilization, (ii) what particular social conditions may influence the onset of various mental disorders, and (iii) how do such social factors act in causing or contributing to the onset of mental disorders.

The question of whether mental disorders are increasing in our own culture with the passage of time has been asked repeatedly and answered contradictorily throughout the past century (e.g. Jarvis 1852, Hawkes 1857, MacCabe 1869,

Maudsley 1872, Tuke 1878, Pratt 1884, Elkind 1927, Dayton 1940, Malzberg 1940, Goldhamer and Marshall 1949). Laterly, a number of attempts have been made to supply scientific answers by undertaking trend anlyses of prevalence and incidence, using total rates of patients in mental hospitals as an index of the former, and first admission rates to mental hospitals as an index of the latter.

While first admission rates have long been considered the best index of the incidence of mental disorder available, various criticisms have been made of studies involving their use, including the following: (i) some question the value of the mass study of diseases conceived as the individual's reaction to his own peculiar environment (an objection that would appear to be rendered invalid by the contributions of epidemiological studies in other fields), (ii) the time span in most such studies has been too short to justify the categorical statements often made that mental disorders are not increasing, (iii) comparisons have sometimes been made of rates obtained at ten year intervals, which do not pre-clude changes in the intervening years, (iv) some studies do not make adequate allowance for changing characteristics of the population (e.g. age and sex distribution), (v) first admission rates to mental hospitals may not truly reflect the incidence of either individual mental disorders or their aggregate. Testing this latter possibility is one of the purposes of the present investigation.

Until a few years ago, Elkind's first study (1927) of Massachusetts rates covered the longest time span (1881-1925), but his figures were calculated on a total population base. These rates showed a substantial increase (of around 60 per cent) during the first thirty years with subsequent stabilization, the in-crease being interpreted as due to differences in facilities available and a changed attitude towards hospitalisation, rather than a rise in incidence. While this interpretation appears substantiated by the more recent findings of Goldhamer and Marshall (vide infra), Elkind's results scarcely excluded the possibility of a rise in incidence. In a subsequent study, Elkind and Taylor (1936) examined the data for Massachusetts from 1920 to 1933 and for New York State from 1917 to 1934, concluding that during these periods there had been no increase in the major psychoses with the possible exception of psychosis with cerebral arterio-sclerosis. Winston (1935) used admission rates for the same two states over slightly longer time spans, and reached similar conclusions. Dorn (1938) and Jacob (1938) also concluded there had been no increase in mental disorders, but on the basis of studies involving periods of only ten years.

Dayton (1940, 1943) undertook a detailed analysis of the Massachusetts data from 1917 to 1933, and subsequently up to 1940. While considering first admission rates as truly indicative of incidence, he found no gross increase in rates during these years and therefore concluded that there was no rapid increase in the incidence of mental disorders. Malzberg (1940, 1943), however, analysing the statistics for New York State over a similar period of time (1909 to 1935, and subsequently up to 1940), obtained different results. While recognising that first admission rates might not be a true measure of incidence in some states, he felt that they were quite acceptable as such for New York, and concluded from the rise in these rates that there had been a corresponding relative increase in mental disease (except for general paresis). Subsequent studies by Somner and Harman (for Illinois, 1922-1943) and Sheldon (for the United States, 1933-1942) recorded certain trends in rates (increases during the earlier years of both studies, followed by declines during the immediate pre-war and war years), but the authors were cautious in interpreting these trends.

The trend analysis extending over the longest time span is that by Gold-hamer and Marshall (1949), who examined the admissions for Massachusetts

over the course of a century (1840 to 1940). They found that there had been a very marked increase in the age specific rates in the older age groups, but that when appropriate comparisons were made (equating the class of patients received, and conditions affecting hospitalisation) age specific rates for ages under 50 were just as high during the last half of the nineteenth century as at the termination of the period studied. While nineteenth century admissions to mental hospitals contained a larger proportion of psychotic and severely deranged patients, there was no long term increase during the century in the incidence of the psychoses of early and middle life. These authors remark that since the secular trend of admission rates has remained constant over the past hundred years, intensive research on short term fluctuations is especially indicated, and add that this research will first need to determine whether these fluctuations represent true changes in incidence.

Of recent years two trend analyses of mental hospital admissions within Canada have been published. Fisher and Stogdill (1952) reported numbers and rates of admissions (by age and sex only) for all Canadian mental hospitals from 1932 to 1947. Wanklin, Buck and Hobbs (1954) analysed first admission rates (by age, sex and major diagnostic groups) for the province of Ontario for the years 1927 to 1946, and found no maintained increases in age standardized rates but a cyclic trend, determined largely by adult male rates and having a close time relationship with employment (the only segment of the population showing a continuous increase in rates being the age group 65 and over).

The present investigation differs from both the latter studies in a number of respects, the most significant of which are as follows: (i) the inclusion of the first eight years of the post-war period, during which certain trends are evident, (ii) the use of different age groups for comparison of age specific rates, (iii) the selection of individual diagnoses for analysis, (iv) the inclusion of age specific rates for selected diagnoses, (v) the examination of methods of admission.

B. Method

Source of data

All statistics used in compiling the present analysis were obtained from the Dominion Bureau of Statistics in Ottawa. Figures were derived from the annual reports on mental institutions (1932-1952) and mental health statistics (1953-1954), census of Canada (1931, 1941, 1951) and intercensal population estimates, labour force estimates, estimates of the consumption of alcoholic beverages, and unpublished material concerning method of admission (1953-1954) and diagnosis of first admissions by place of birth (1951).

Coverage

The first admissions on which the present study is based do not include patients admitted to every mental institution in Canada reporting to the Dominion Bureau of Statistics, but constitute patients admitted to those institutions submitting detailed information on each first admission by means of statistical reporting cards. Since its inception in 1932 the card system of reporting has been used by institutions representing well over 80 per cent (and since 1936 over 90 per cent) of total reported mental hospital capacity in Canada. Coverage has been most extensive for federal and provincial mental hospitals, and institutions reporting by schedule only (not submitting detailed cards on each patient) have been for the most part either private hospitals or county and municipal institutions. County and municipal institutions accepting a significant proportion of mental patients are confined to one province, Nova

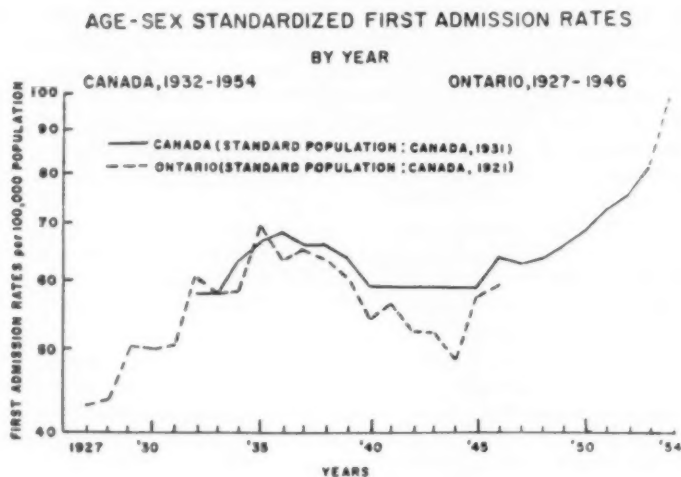AGE-SEX STANDARDIZED FIRST ADMISSION RATES

BY YEAR

Figure 1

Scotia (having a population around 5 per cent that of the whole country), but the same institutions also serve largely as homes for the aged and infirm, and information concerning mental patients has so far proved impossible to segregate.

The period of time for which data have been analysed—the years 1932 to 1953 inclusive—is the first twenty-two year period for which information is available on first admissions to Canadian mental hospitals as a whole. During this time the annual numbers of first admissions recorded on statistical reporting cards increased from 5,774 to 12,778, and the total number of first admissions involved in the present study is 179,656.

Initially, it was planned to include the year 1954 in this analysis, but on publication of the annual report it was noted that first admissions to several psychiatric units in general hospitals had been included in the detailed statistics on first admissions for the first time. Although the bed capacity of these psychiatric units was relatively small, the numbers of first admissions was high, particularly for certain diagnoses. While rates for 1954 have been included in certain tables (and in figure 1), with annotations concerning the general hospital psychiatric units, they have been excluded from the analysis of results.

Corrections made in calculating rates

In the calculation of age specific rates published hitherto (Dominion Bureau of Statistics, and Fisher and Stogdill) it appears that the population of the whole of Canada has been used as the base population for all years. This results in two errors, the first of which is the more significant.

(i) Prior to 1936 the province of Manitoba (having a population about 7 per cent that of the whole country) did not submit detailed information by statistical reporting cards. The use of figures for the whole country as the base population during the years 1932 to 1935 therefore results in the rates obtained for these years being unduly low.

(ii) Newfoundland (having a population about 2.5 per cent that of Canada as a whole) was first included in population estimates for the whole country in 1949, but detailed information on mental hospital admissions was first published

CANADA
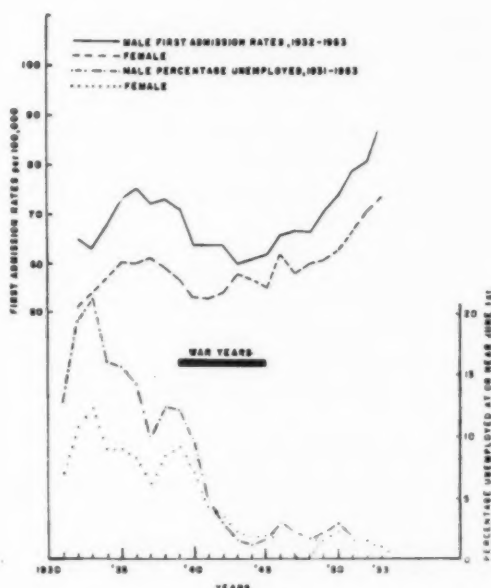STANDARDIZED FIRST ADMISSION RATES–and UNEMPLOYMENT
BY SEX

Figure 2

the following year. The inclusion of figures for Newfoundland in the base population figures for 1949 therefore results in slightly low rates being obtained for this year.

These two sources of error have both been obviated in the present study by exclusion of Manitoba from all base population figures prior to 1936, and of Newfoundland for the year 1949.

A further source of error discovered was the transposal of figures for warrant and voluntary admissions for Ontario in the 1942 annual report published by the Dominion Bureau of Statistics, and this has also been corrected in the present study.

Changes in data available on selected diagnosis.

Thirteen diagnoses were selected for study, that together have consistently accounted for about 85 per cent of first admissions (table III). However, certain changes in classification and presentation of data by the Dominion Bureau of Statistics resulted in differences between information available on certain diagnoses prior to 1950 and subsequently.

The Sixth Revision of the International Statistical Classification of Diseases, Injuries and Causes of Death, 1948, was incorporated into the annual reports on Canadian mental hospitals for the first time in 1950. This led to two of the selected diagnoses (psychoses with mental deficiency and with psychopathic personality) being included in a larger category of "other and unspecified

psychoses", so that rates for these two diagnoses subsequent to 1949 could not be calculated. The adoption of the new classification also resulted in the diagnosis of psychopathic personality (without psychosis) being replaced by that of pathological personality, possibly a somewhat broader category.

A further change instituted at this time was the expansion of tables giving numbers of first admissions by diagnosis and age groups. The significance of this development for the present study is that only since 1950 has it been possible to calculate age specific rates for three of the selected diagnoses (pathological personality, alcoholism and mental deficiency—all without psychosis).

First admission rates were calculated and expressed as follows:

(i) All rates are either age specific or standardized for age, with the exception of rates by method of admission.

(ii) Standardized rates were calculated by the direct method (Hill, 1955), using the population of Canada, 1931, as the standard population.

(iii) Rates by method of admission were calculated by using the population aged 20 years and over as the base population.

(iv) All rates are expressed per 100,000 general population.

(v) Graphs of rates are all semi-logarithmic (one or two cycle), with the exception of figure 2.

Results of analysis of first admission rates are presented as follows:

(i) Age standardized rates, total and by sex, 1932-1953.

(ii) Age sex specific rates, 1932-1953.

(iii) Age sex specific rates by diagnosis, 1932, 1936, 1941, 1946 and 1951; and rates for selected diagnosis by specified age groups and by sex, 1932-1953.

(iv) Rates by method of admission, based on population aged 20 years and over, total and by sex, 1932-1953.

C. Results

1. *AGE STANDARDIZED FIRST ADMISSION RATES, 1932-1953.*

(a) *Total rates* (Table I, Figure 1)

The rates for both sexes combined show an increase from 58 in 1932 to 68 in 1936, then recede to 59 by 1940, remaining stabilized at this level throughout the war years, and subsequently increasing sharply to 82 in 1953.

(b) *Comparison with total rates for the province of Ontario* (Figure 1)

Rates for the province of Ontario (having a population approximately one third that of the whole of Canada) were calculated by Wanklin, Buck and Hobbs (1954) for the years 1927 to 1946, using the 1921 population of Canada as the standard population. These rates for Ontario reached a peak in 1935 (the year before the country as a whole) and continued to decline during the war years (while rates for the whole country remained constant), but otherwise the trends for Ontario and for the whole of Canada bear a close relationship to each other throughout the fifteen years for which they overlap.

There is a continuous excess of male rates over female, which is greatest during the pre-war depression years and least during the years 1943 to 1946.

(d) *In relation to unemployment and war* (Table I, Figure 2)

The 22 year period under examination is divided by the war into three shorter periods of approximately equal duration: (i) a pre-war era of economic depression and gradual recovery, with high but diminishing unemployment (the percentage unemployed being higher for males than females), (ii) the war years,

TABLE I

Standardized First-admission Rates per 100,000, and Percentages of
Total Labour Force Unemployed.   Canada, 1931-1954[a].

Year	Standardised First-Admission Rates per 100,000 [b]			Percentages of Total Labour Force Unemployed [c]		
	Male	Female	Total	Male	Female	Total
1931	x	x	x	12.7	6.9	11.5
1932	65	51	58	19.2	10.7	17.5
1933	63	54	58	21.0	12.2	19.3
1934	68	57	63	15.9	8.9	14.5
1935	73	60	67	15.5	8.9	14.2
1936	75	60	68	14.0	8.1	
1937	72	63	66	9.9	6.0	9.1
1938	73	59	66	12.2	8.4	11.4
1939	71	57	64	12.0	9.0	11.4
1940	64	53	59	9.8	6.9	9.2
1941	64	53	59	4.5	4.1	4.4
1942	64	54	59	2.9	3.1	3.0
1943	60	58	59	1.5	2.1	1.7
1944	61	57	59	1.1	1.7	1.4
1945	62	55	59	1.6	1.7	1.6
1946	66	62	64	2.9	1.6	2.6
1947	67	58	63	2.0	1.5	1.9
1948	67	60	64	1.6	1.6	1.6
1949	71	61	66	2.2	1.4	2.0
1950	74	63	69	2.7	2.1	2.6
1951	79	67	73	1.6	1.4	1.5
1952	81	71	76	2.2	1.4	2.0
1953	89	74	82	2.5	1.0	2.1
1954(a)	(108)	(89)	(99)	4.6	2.0	4.0

(a) First-admissions to several psychiatric units in general hospitals are included for the first time in 1954.
(b) The population of Canada, 1931, was used as the standard population.
(c) Unemployed and seeking employment at or near June 1st of each year.
x   Figures not available.

with little unemployment and scarcely any differential between the sexes, (iii) the post-war period of economic expansion, with continued low unemployment but a gradual return of the pre-war sex differential.

First admission rates show a definite time relationship with figures for unemployment up till the end of the war, but subsequently increase rapidly in the absence of economic stress.   It may also be significant that the female admission rates most closely approximate the male rates during the year 1943 to 1946, while the female percentage unemployed exceeds the male only for the years 1942 to 1945.

2.   AGE SEX SPECIFIC FIRST ADMISSION RATES, 1932-1953.

Table II gives age specific first admission rates, total and by sex, for each year from 1932 to 1953.

Figure 3 shows the total rates (for both sexes) by age groups, at three points in time—the years 1932, 1941 and 1951.   These represent typical curves for age specific first admission rates to mental hospitals in North America during the past few decades.   However, this figure illustrates an error that may result from examining rates at ten year intervals alone, since, although all rates are evidently

TABLE II

Age Sex Specific First-Admission Rates Per 100,000. Canada, 1932-1954(a)

Year	0-19 years			20-29 years			30-39 years			40-49 years			50-59 years			60-69 years			70 years and over		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
1932	29	19	24	74	62	68	95	72	84	86	72	79	85	79	82	101	91	96	154	125	140
1933	26	26	26	75	64	70	98	81	90	89	73	82	79	72	76	88	77	83	139	103	121
1934	28	24	26	78	76	77	102	84	93	91	80	86	90	78	84	118	76	98	148	131	140
1935	33	23	28	86	73	80	112	96	104	94	84	89	92	83	88	108	100	104	166	132	149
1936	30	25	28	89	75	82	114	91	103	106	87	97	96	79	88	112	95	104	175	119	147
1937	33	27	30	83	66	75	103	96	100	97	92	95	93	88	91	109	82	96	164	119	142
1938	34	26	30	86	64	75	105	87	97	96	87	92	92	86	90	116	95	106	169	121	145
1939	26	23	25	87	73	80	96	84	90	94	80	87	98	83	91	127	92	111	186	128	157
1940	28	22	25	76	57	67	84	77	80	85	82	83	85	80	83	95	88	91	181	129	155
1941	30	21	26	78	61	70	81	75	78	82	70	76	78	78	78	98	92	95	190	147	168
1942	29	24	27	80	63	72	79	75	77	79	71	75	79	70	75	105	83	94	187	164	175
1943	29	26	28	74	66	70	71	78	75	68	76	72	65	72	68	101	102	101	219	178	198
1944	29	22	25	73	66	70	75	84	79	72	75	73	74	83	79	94	92	93	214	188	201
1945	24	21	23	83	61	72	77	83	80	78	77	77	75	78	77	100	91	96	226	187	206
1946	29	25	27	74	74	74	81	85	83	85	84	85	85	80	83	111	96	104	248	207	227
1947	25	21	23	84	71	78	80	85	83	91	78	85	89	81	85	122	95	109	225	188	207
1948	24	19	21	82	72	77	82	89	86	94	88	91	87	84	86	109	102	106	258	203	230
1949	22	19	21	95	71	83	88	99	93	100	85	93	96	92	94	123	100	112	237	186	212
1950	31	25	28	93	75	84	91	93	92	95	83	89	95	87	91	115	92	104	246	192	219
1951	34	25	30	97	80	88	95	101	98	95	97	96	106	93	100	122	104	114	275	184	230
1952	35	27	31	107	84	95	104	108	106	99	99	99	100	95	98	121	102	112	262	218	240
1953	33	25	29	122	91	106	117	111	114	117	107	112	112	100	106	125	108	117	286	233	259
1954(a)	(40)	(32)	(36)	(140)	(112)	(126)	(155)	(143)	(149)	(147)	(130)	(139)	(150)	(125)	(138)	(156)	(115)	(136)	(278)	(240)	(259)

(a) First-admissions to several psychiatric units in general hospitals are included for the first time in 1954.
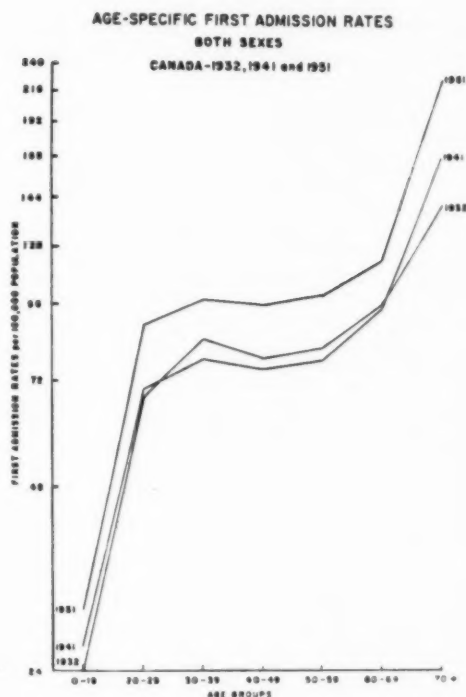
Figure 3

higher in 1951 than in 1932 or 1941, the 1951 rates were in fact closely approached (and in two age groups exceeded) by the rates around the year 1936.

Figures 4 and 5 show the yearly trend of age specific rates, by sex, throughout the 22 year period. The curves on these two graphs were all plotted on single cycle semi-logarithmic graph paper, and are hence comparable with one another. The curves have been spaced arbitrarily (rather than in correct relationship to each other) for the sake of clarity, but the rates at the beginning and end of the period are indicated.

(a) *0-19 years*

There was considerable fluctuation in the admission rates in this age group from year to year, but the overall trend was downward from the beginning of the war until 1950, when a sudden increase occurred that coincided with the addition of two provincial training schools for mental defectives. Male rates showed a tendency to be moderately in excess of female rates throughout.

(b) *20-29 years*

The trend of total rates for this age group corresponds closely with the overall trend of age standardized rates (vide supra), with an increase from 68 in 1932 to 82 in 1936, a decline to rates of about 70 during the war years, and a subsequent rise to 106 in 1953. Male rates tended to considerably exceed
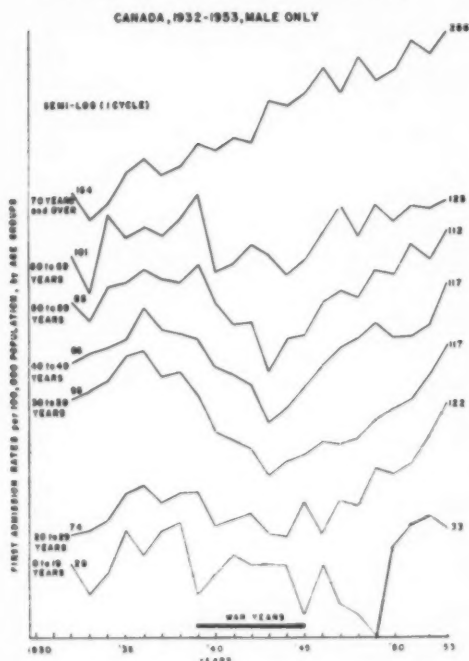
AGE-SPECIFIC YEARLY FIRST ADMISSION RATES

CANADA, 1932-1953, MALE ONLY

AGE-SPECIFIC YEARLY FIRST ADMISSION RATES

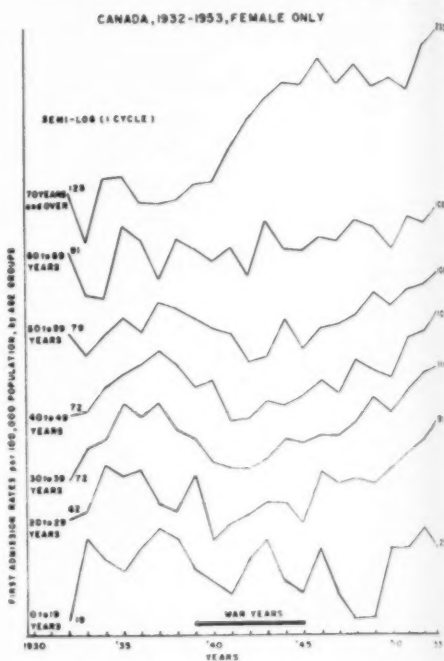CANADA, 1932-1953, FEMALE ONLY

Figure 4

Figure 5

female rates, and the overall rise in male rates was greater for this age group than for any other, except for the age group 70 years and over.

(c) *30-39 years to 60-69 years inclusive*

The rates for each of these age groups showed a cyclic trend, with high rates in the pre-war period, low rates during wartime, and then progressive increases to 1953. The cyclic trend was more pronounced in the younger of these age groups than in the group aged 60-69, and more marked for male rates than female. In each age group male rates exceeded female rates throughout the pre-war period, fell slightly below them during the latter part of the war, and then rose to exceed the female rates again after a period of time that varied inversely with age.

(d) *70 years and over*

The overall trend of rates in this age group is progressively upward, and the rates for both sexes almost doubled during the 22 year period. Male rates were consistently in excess of female and showed a more regular increase, the most marked rise in female rates occurring during the war years.

Although the percentage excess of 1953 rates over 1932 rates is greater for this age group than for any other, it should be noted that the rate of post-war increase was proportionately at least as great in most of the younger age groups.

3. *AGE SEX SPECIFIC FIRST ADMISSION RATES BY DIAGNOSIS, 1932, 1936, 1941, 1946 and 1951; AND FIRST ADMISSION RATES FOR SELECTED DIAGNOSIS BY SPECIFIED AGE GROUP AND BY SEX, 1932-1953.*

Thirteen diagnoses were selected for study, that have together consistently represented about 85 per cent of all first admissions, as shown in table III. Age sex specific rates for these diagnoses were calculated for five significant years, or as raw data permitted, and are given in table IV.

TABLE III

Percentage Frequency of Selected Diagnoses Among First-Admissions.
Canada, 1932, 1936, 1941, 1946 and 1951

Diagnosis	1932	1936	1941	1946	1951
C.N.S. Syphilis...................	5.6	5.4	4.8	4.0	1.6
Schizophrenia....................	22.8	22.4	22.7	21.3	22.2
Manic depressive.................	12.9	12.3	12.3	12.9	9.9
Involutional.....................	2.6	2.5	3.4	3.7	3.8
Paranoia and paranoid conditions...	2.7	2.9	2.1	2.2	2.5
Senile psychoses and cerebral arteriosclerosis..........	13.1	12.5	16.6	18.3	16.4
Alcoholic psychoses...............	1.8	1.8	2.0	2.2	2.6
Psychosis with psychopathic personality.........	0.7	0.6	0.7	0.7	x
Psychosis with mental deficiency....	4.4	3.5	2.6	3.1	x
Psychoneuroses...................	2.4	2.8	3.6	4.9	9.3
Psychopathic personality *without* psychosis(a).............	x	0.0	0.7	1.3	2.1[a]
Alcoholism *without* psychosis........	0.5	1.3	0.8	1.1	3.5
Mental deficiency *without* psychosis..	14.3	16.0	15.1	12.9	13.6
Totals of above diagnoses............. (percentage of all first admissions)	83.8	84.9	87.4	88.6	87.5

x   Figures not available.
(a) "Pathological personality without psychosis" for year 1951.

TABLE IV

Age Sex Specific First-Admission Rates Per 100,000 for Selected Diagnoses.
Canada, 1932, 1936, 1941, 1946 and 1951.

Diagnosis	Year	0–19 years		20–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70 years and over	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
C.N.S. Syphilis	1932	–	–	–	1	12	4	14	2	12	3	7	–	–	–
	1936	–	–	1	1	13	4	19	3	11	3	8	1	–	–
	1942	–	–	2	–	9	2	13	4	10	3	6	1	1	–
	1946	–	–	–	–	5	2	13	4	12	2	9	1	2	–
	1951	–	–	–	–	1	–	5	2	7	2	6	2	2	–
Schizophrenia	1932	3	2	36	22	34	24	20	15	10	12	6	7	2	3
	1936	4	3	42	27	40	26	22	19	11	11	4	8	–	–
	1941	4	3	41	22	31	29	18	18	8	12	6	6	1	–
	1946	4	3	35	31	30	29	18	17	8	11	6	6	–	–
	1951	4	3	49	33	36	39	21	27	8	11	4	6	1	3
Manic depressive	1932	1	1	9	11	14	13	12	17	18	13	9	13	3	2
	1936	1	1	11	12	13	19	15	18	13	17	11	10	3	4
	1941	1	1	9	12	10	17	12	12	12	15	8	10	2	4
	1946	1	2	9	14	12	22	13	17	13	14	11	14	3	3
	1951	–	1	8	10	10	17	12	17	15	15	10	14	6	5

TABLE IV (Continued)
Age Sex Specific First-Admission Rates Per 100,000 for Selected Diagnosis.
Canada, 1932, 1936, 1941, 1946 and 1951.

Diagnosis	Year	0–19 years		20–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70 years and over	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
Involutional	1932	–	–	–	–	–	–	1	5	5	15	6	5	–	–
	1936	–	–	–	–	–	–	1	9	9	9	4	4	–	–
	1941	–	–	–	–	–	–	2	9	6	17	6	5	–	–
	1946	–	–	–	–	–	–	2	9	9	18	7	9	2	1
	1951	–	–	–	–	–	–	–	8	12	21	13	14	1	–
Paranoia and paranoid conditions	1932	–	–	1	1	3	2	3	4	5	6	1	3	–	–
	1936	–	–	–	1	2	4	4	8	5	6	2	4	2	1
	1941	–	–	–	–	1	3	4	3	3	4	2	2	–	2
	1946	–	–	–	–	2	3	3	6	4	6	2	3	–	–
	1951	–	–	–	–	3	3	4	5	7	6	4	3	–	–
Senile psychosis and cerebral arteriosclerosis	1932	–	–	–	–	–	–	1	2	11	8	49	45	132	115
	1936	–	–	–	–	–	–	1	1	12	10	54	46	156	109
	1941	–	–	–	–	–	–	–	–	10	7	53	48	177	132
	1946	–	–	–	–	–	–	–	–	7	4	55	40	225	188
	1951	–	–	–	–	–	–	–	–	6	5	48	33	248	165
Alcoholic psychoses	1932	–	–	1	–	3	–	5	–	3	–	5	–	–	–
	1936	–	–	1	–	5	–	6	–	4	–	4	–	–	–
	1941	–	–	1	–	4	1	5	1	5	–	2	–	–	–
	1946	–	–	2	–	4	1	8	1	5	1	2	1	–	–
	1951	–	–	2	–	6	2	8	2	9	1	5	1	–	–
Psychosis with psychopathic personality(a)	1932	–	–	1	–	1	–	1	–	–	–	–	–	–	–
	1936	–	–	1	–	1	–	1	–	–	–	–	–	–	–
	1941	–	–	1	–	2	–	1	–	–	–	–	–	–	–
	1946	–	–	2	–	1	–	1	–	–	–	–	–	–	–
Psychosis with mental deficiency(a)	1932	–	–	6	4	4	5	4	4	2	3	1	–	–	–
	1936	1	–	5	4	5	4	4	3	2	2	1	2	–	–
	1941	1	–	4	3	3	3	2	2	1	1	–	–	–	–
	1946	1	1	4	5	3	3	2	3	1	2	–	2	–	–
Psychoneuroses	1932	–	–	1	3	4	2	4	3	1	2	1	3	–	–
	1936	–	–	2	3	3	7	4	3	2	2	1	3	–	–
	1941	–	–	3	3	3	7	4	5	3	3	2	4	–	–
	1946	–	1	4	7	4	8	5	8	4	4	3	4	–	–
	1951	–	1	8	13	9	16	10	18	11	13	7	10	–	–
Pathological personality without psychosis(b)	1950	–	–	5	3	4	1	4	1	3	1	1	–	–	–
	1951	–	–	6	2	5	1	3	2	2	–	1	–	–	–
	1952	–	–	6	3	4	3	2	1	2	1	2	–	–	–
Alcoholism without psychosis(b)	1950	–	–	2	–	6	2	11	1	6	–	4	–	–	–
	1951	–	–	2	–	10	2	15	3	11	–	5	–	–	–
	1952	–	–	3	–	11	2	14	3	12	2	7	–	2	–
Mental deficiency without psychosis(b)	1950	23	18	7	7	5	5	4	2	4	3	2	2	–	–
	1951	24	17	8	8	5	5	3	3	3	3	1	1	–	–
	1952	24	19	8	8	4	5	4	4	4	3	2	1	–	–

(a) For the years 1932, 1936, 1941 and 1946.
(b) For the years 1950, 1951 and 1952.

In order to study the yearly trends in first admission rates for these diagnoses, in an age group of high incidence, further tables were constructed. Specific age groups were selected for each diagnosis, that covered wide enough age ranges to prevent undue fluctuation in the percentage of cases occurring in that age group (in spite of certain changes occurring in age of maximum incidence). The mean percentage of cases, and variation in percentage of

TABLE V

Percentage of Selected Diagnosis in Specified Age Groups.
First-Admissions, Canada, 1932, 1936, 1941, 1946 and 1951.

Diagnosis	Specified Age Group	Variation in Percentage of Cases In Specified Age Group	Mean Percentage of Cases In Specified Age Group
C.N.S. Syphilis.................	30–69 years	92–97%	93%
Schizophrenia.................	20–39 years	65–69%	67%
Manic depressive..............	20–59 years	82–85%	84%
Involutional..................	40–69 years	93–98%	95%
Paranoia and paranoid conditions.	30–59 years	77–84%	80%
Senile psychoses and cerebral arteriosclerosis	60 years and over	86–96%	91%
Alcoholic psychoses.............	30–59 years	73–85%	80%
Psychosis with psychopathic personality(a)....	20–39 years	57–78%	64%
Psychosis with mental deficiency(a)..........	20–39 years	55–61%	53%
Psychoneuroses................	20–59 years	85–88%	87%
Pathological personality *without* psychosis(b)...........	20–39 years	59–63%	61%
Alcoholism *without* psychosis(b)...	30–59 years	79–86%	82%
Mental deficiency *without* psychosis(b)..........	0–19 years	73–75%	74%

(a) Percentages for years 1932, 1936, 1941 and 1946.
(b) Percentages for years 1950, 1951 and 1952.

cases, occurring in the specific age groups selected for each diagnosis is shown in table V. The mean percentage of cases in the specified age group was then applied to the total number of cases with that diagnosis, in calculating estimated yearly rates for each diagnosis over the period 1932-1953, as presented in table VI.

Trends for some of the diagnoses represented in table VI are shown graphically (in correct relationship to each other) in figures 6 and 7. It is necessary to add that these two graphs were plotted on two cycle semi-logarithmic paper, and equivalent degrees of fluctuation therefore appear only half as great in figures 6 and 7 as in figures 4 and 5.

(a) *C.N.S. Syphilis*

This disorder showed a consistent excess of male over female, in the order of about 3 to 1, and a gradual increase in the age of maximum incidence, due to diminishing rates affecting the younger age groups before the older. Rates for the age range 30-69 started to decline around the beginning of the war, and fell rapidly during the post-war years.

(b) *Schizophrenia*

This diagnosis showed maximum first admission rates among males aged 20-29, while for females the rates for ages 30-39 were sometimes higher than those for the 20-29 group. Two thirds of all cases were in the age range 20 to 39, and rates for both sexes then decreased progressively with age. In the age group 20-29 male rates remained in excess of female (usually in a ratio of about 3 to 2), and up till the end of the war male rates were in excess of female up to the age of 50, but by 1951 female rates were in excess of male from the age of 30 on.

Rates for the age range 20 to 39 showed a cyclic rise and fall before the war, stability during the war years, and a considerable post-war increase (amounting to about 50 per cent for both sexes between 1946 and 1953).
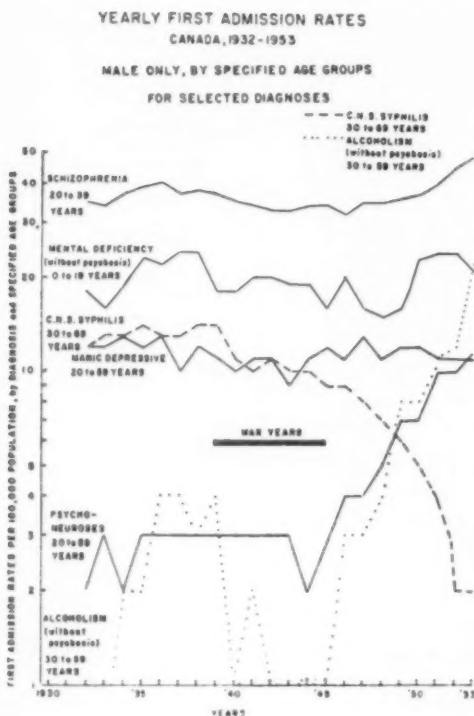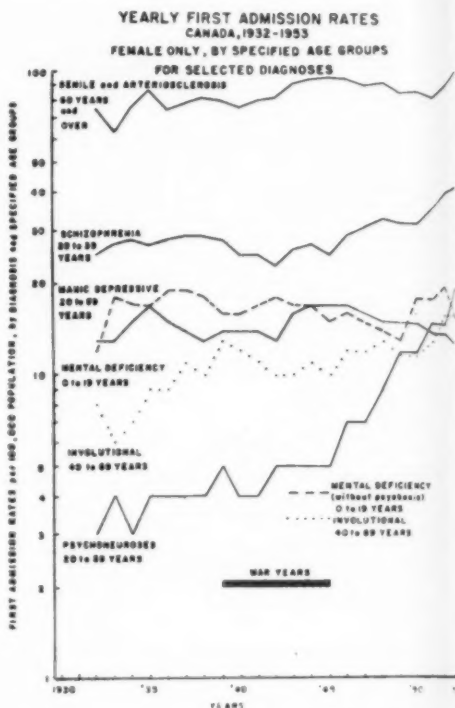
Figure 6

Figure 7

(c) *Manic depressive psychosis*

This disorder showed a fairly equal distribution of first admissions through-out adult life, with a slight preponderance of female morbidity over male, and relatively little fluctuation in rates for either sex during the 22 year period.

(d) *Involutional psychoses*

The maximum incidence of this diagnosis among females was 50-59 years, while for males the rates in the 60-69 age group were about equal to those in the 50-59 group. For the age range 40 to 69, females were in excess of males in a ratio of about 2 to 1, and both sexes showed a considerable increase during the post-war period.

(e) *Paranoid states*

The rates for these disorders first became significant after the age of 30, and reached a maximum between the ages of 40 and 60. Female rates remained slightly in excess of male rates, but neither showed gross fluctuations during the 22 year period.

(f) *Senile psychosis and psychosis with cerebral arteriosclerosis*

The rates for the organic psychoses of senility increase with advancing age, and are consistently higher for male than female. Table IV shows that the rates for these diagnoses diminished for the age group 50-59, remained farly con-stant for males and diminished for females in the age group 60-69, but increased

TABLE VI

Estimated First-Admission Rates Per 100,000 For Selected Diagnoses, By Specified Age Groups, and By Sex.   Canada, 1932–1954[a]
Based on Mean Percentages of Total Cases Shown in Table V.

Year	C.N.S. Syphilis 30-69 years		Schizophrenia 20-39 years		Manic depressive 20-59 years		Involutional 40-69 years		Paranoid states 30-59 years		Senile and cerebral arteriosclerosis 60 years and over		Alcoholic psychoses 30-59 years		Psychosis with mental deficiency 20-39 years		Psycho-neuroses 20-59 years		Psychopathic personality (b) 20-39 years		Alcoholism 30-59 years		Mental deficiency 0-19 years	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1932	12	3	35	25	12	13	3	8	3	4	88	76	4	–	5	5	2	3	x	x	1	–	18	12
1933	13	4	34	27	12	13	3	6	3	5	85	65	4	–	5	5	3	4	x	x	–	–	16	18
1934	13	4	37	28	13	15	5	7	3	5	94	76	4	–	4	4	2	3	x	x	2	–	19	17
1935	14	4	39	27	12	17	4	9	4	5	97	87	5	–	5	5	3	4	1	–	2	–	23	17
1936	13	4	40	28	13	15	4	9	4	6	99	75	5	–	5	4	3	4	2	–	4	–	22	19
1937	13	5	37	29	10	14	4	11	3	4	97	79	5	–	4	4	3	4	1	–	4	–	24	19
1938	14	3	38	29	12	13	4	10	4	5	94	82	5	1	4	4	3	4	1	–	3	–	24	18
1939	14	3	37	28	11	14	6	13	4	3	106	80	4	1	4	3	3	5	1	–	4	–	18	16
1940	11	3	35	25	10	14	5	12	4	4	93	76	4	–	3	2	3	4	–	–	1	–	18	16
1941	10	3	34	25	11	14	4	11	3	3	100	81	5	–	3	3	3	4	1	–	2	–	20	17
1942	11	3	33	23	9	13	5	10	3	3	94	83	5	1	3	3	3	5	1	–	1	–	20	18
1943	10	4	33	26	11	16	4	10	2	4	100	92	3	–	3	3	3	5	1	–	–	–	19	17
1944	10	3	34	27	11	17	5	11	2	4	97	95	3	–	3	2	2	5	1	–	1	–	19	17
1945	9	3	34	25	12	17	4	10	3	4	105	96	4	–	3	3	3	5	1	–	1	–	16	15
1946	9	3	32	29	11	17	6	12	3	4	114	95	6	–	4	4	4	7	2	1	3	–	20	16
1947	8	3	35	31	13	16	7	12	3	4	104	91	8	1	3	3	4	7	3	1	3	–	16	15
1948	7	2	35	33	11	15	7	13	4	5	108	93	7	2	3	3	5	9	3	1	4	–	15	14
1949	6	2	36	32	12	15	7	12	4	5	107	86	9	2	3	3	7	12	4	1	8	1	16	13
1950	5	1	37	32	12	15	8	12	4	5	102	87	7	2	x	x	7	12	5	2	8	1	23	18
1951	4	1	40	36	11	14	8	13	4	5	116	84	8	2	x	x	10	15	5	2	11	2	24	18
1952	2	1	45	41	11	14	8	16	4	5	110	93	9	1	x	x	10	15	5	3	12	2	24	20
1953	2	1	49	43	11	13	8	16	4	5	114	104	8	2	x	x	13	20	7	3	22	3	21	16
1954[a]	(2)	(1)	(53)	(47)	(11)	(18)	(10)	(18)	(5)	(5)	(118)	(97)	(10)	(2)	x	x	(23)	(30)	(10)	(4)	(28)	(4)	(25)	(18)

(a) First-admissions to several psychiatric units in general hospitals are included for the first time in 1954.
(b) "Pathological personality without psychosis" for the years 1950–1954 inclusive.
x Figures not available.

greatly for ages 70 and over. The yearly trend for all members of the group aged 60 and over, shown in table VI, indicates a progressive but relatively gradual increase in rates for both sexes.

(g) *Psychoneuroses*

This group of disorders showed a fairly even distribution of first admission rates throughout adult life, with a female preponderance averaging about 3 to 2. Rates for all age groups showed relatively slight increases during the first fifteen years of the study, but approximately fourfold increases for both sexes between 1945 and 1953.

(h) *Psychopathic personality (Pathological personality)*

These diagnoses, either with or without psychosis, showed a male pre-dominance of about 2 to 1, and decreasing first admission rates with advancing age. The estimated rates for *psychopathic personality without psychosis*, for the age range 20 to 39, increased approximately fourfold for both sexes during the post-war period (a trend that is evident even before the change in termin-ology to pathological personality in 1950, though the latter may be considered a broader category and hence may have accentuated this trend).

The rates for the diagnosis of *psychosis with psychopathic personality* scarcely reached significant levels, and the overall trend (not shown) was slightly downward until figures ceased to be available in 1950.

(i) *Alcoholism and alcoholic psychoses*

First admission rates for both alcoholism without psychosis and alcoholic psychoses reached maximum levels between the ages of 30 and 59, with a male preponderance of about 5 to 1. Overall rates for the age range 30 to 59 showed a temporary pre-war increase for alcoholism without psychosis (during the years 1936 to 1939), but otherwise no remarkable change until the post-war period, when rates for alcoholic psychoses approximately doubled, and rates for alcoholism without psychosis increased precipitately.

Estimates showing the *apparent annual consumption of spirits and beer* per capita for five significant years are given in table VII. It may be seen that the increase in rates for alcoholic psychoses since the war is of the same order of magnitude as the increase in the apparent consumption of alcohol, whereas the post-war increase in rates for alcoholism without psychosis is altogether disproportionate to the other figures.

TABLE VII

Estimated Annual Per Capita Consumption of Spirits and Beer,
Based on Population Aged 20 Years and Over.
Canada, 1930, 1933, 1939, 1945 and 1953.

Year (ending March 31)	Apparent Consumption in Gallons Per Person (Aged 20 years and Over) Per Year	
	Spirits	Beer
1930	0.61	10.3
1933	0.24	6.5
1939	0.49	9.1
1945	0.49	14.4
1953	1.03	23.2

(j) *Mental deficiency*

The highest first admission rates for *mental deficiency without psychosis* were in the age group 0-19, with male rates somewhat in excess of female. Rates thereafter gradually diminished with advancing age. Considerable fluctuation occurred over the 22 year period, comparable with that already noted for the under 20 age group as a whole.

The diagnosis of *psychosis with mental deficiency* was rarely made before the age of 20, and thereafter gradually decreased with advancing age. Sex distribution was about even, but throughout the period during which this diagnosis was recorded (prior to 1950) there was a gradual downward trend in rates for both sexes.

4. FIRST ADMISSION RATES BY METHOD OF ADMISSION, BASED ON POPULATION AGED 20 YEARS AND OVER, 1932-1953.

Methods by which patients are admitted to Canadian mental hospitals fall into three broad categories. Throughout the period studied the most frequent method of admission was on medical certificates, which include certificates of mental illness, mental deficiency and epilepsy. Other methods of admission are on the patient's voluntary application and on legal warrants. Several types of warrant have been used quite frequently and include the magistrate's warrant of remand for purposes of investigation, the warrant for detention and treatment of habitués (addicts to alcohol or other drugs), and the warrant for detention and treatment of mentally abnormal persons charged with or convicted of criminal offences.

Annual reports of the Dominion Bureau of Statistics have not contained numbers of first admissions for different methods of admission by age groups, and hence age specific or age standardized rates by method of admission could not be calculated. Clinical experience, however, indicates that the great majority of admissions in the very young and old age groups are on medical certificates. Moreover, the rates for all types of admission under the age of 20 are relatively low (vide supra), and it was therefore concluded that the most comparable rates by method of admission would be obtained by basing them on the total population aged 20 years and over, as presented in table VIII.

(a) *Certificate*

While the percentage of first admissions committed on medical certificates (not shown) was consistently higher among females than males, rates based on the population age 20 and over show remarkably little difference between the sexes. The trends over the 22 year period show the same rise and fall during the pre-war years as the overall age standardized rates, with relative stability during the war, but the post-war rise in rates is somewhat less marked and less consistent than that observed in the overall rates.

(b) *Voluntary*

Male rates show a marked preponderance over female during the pre-war period, and a much less marked excess subsequently. The long term trends show no overall change until the last 5 years of the period studied, when there was a fourfold increase in rates for both sexes.

(c) *Warrant*

Male rates remained consistently in excess of female, in a ratio that showed an overall increase from about 2 to 1 to about 3 to 1. The rates for both

TABLE VIII

First Admission Rates Per 100,000 By Method of Admission,
Based on Population Aged 20 Years and Over.
Canada, 1932–1954 (a, b)

Year	Certificate			Voluntary			Warrant		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1932 (a)	71	66	69	(17)	(12)	(15)	22	10	16
1933	72	76	74	8	3	6	26	12	19
1934	77	83	80	8	4	6	28	12	20
1935	82	84	83	10	5	8	30	13	22
1936	87	86	87	8	3	6	30	13	22
1937	82	87	84	7	4	6	30	12	21
1938	86	83	85	7	5	6	28	11	
1939	83	81	82	8	5	6	23	11	19
1940	80	77	79	6	4	5	20	10	15
1941	80	78	79	6	5	6	20	10	15
1942	78	74	76	9	8	8	19	9	14
1943	78	82	80	5	6	5	16	9	13
1944	81	86	84	6	4	5	15	8	12
1945	76	82	79	11	6	8	18	7	13
1946	86	91	88	8	5	6	18	9	14
1947	89	88	89	6	4	5	18	7	12
1948	82	85	84	7	6	7	18	7	13
1949	85	82	83	11	9	10	18	8	13
1950	93	89	91	13	10	12	18	7	13
1951	100	92	96	14	14	14	18	8	13
1952	99	100	99	17	15	16	20	7	13
1953	97	92	94	29	27	28	20	6	13
1954 (b)	97	94	95	(44)	(37)	(41)	22	6	14

(a) 54 per cent of the first admissions recorded as voluntary for the year 1932 came from a single province (Quebec) whose law did not provide for voluntary admissions at that time.
(b) First admissions to several psychiatric units in general hospitals are included for the first time in 1954, and about 75 per cent of these first admissions to psychiatric units were recorded as voluntary (23 per cent being recorded as "other").

sexes showed a moderate increase during the first few years and then declined to a somewhat lower level than previously, female rates continuing to decline slightly during the post-war period while male rates showed a slight increase at the end of the period studied.

D. Discussion

The first conclusion drawn from the present study is that first admission rates to Canadian mental hospitals during the years 1932 to 1953 do not reflect incidence alone, either for individual diagnoses or for aggregates of all mental disorders. The very rapid post-war increases in first admission rates for psycho-neuroses, psychopathic personality and alcoholism without psychosis (the latter greatly in excess of the increases in either alcoholic psychoses or apparent consumption of alcohol), together with a corresponding increase in the voluntary method of admission, cannot be attributed solely to increased incidence.

It further appears most unlikely that first admission rates to mental hospitals of any state at any period of time represent simply individual or aggregate incidence (as a number of workers have assumed), although sometimes incidence may be the limiting factor governing increases or decreases in rates. Frequently, however, as Lemkau remarks (1955), such figures may indicate more about the

economic situation of the area concerned and about the local attitudes towards mental illnesses than about the illnesses themselves.

It seems indeed that there are many factors influencing first admission rates to mental hospitals, a number of which have been inferred from the present investigation and similar analyses, and are discussed below.

1. Reliability of data and calculations

The reliability of data collected and of calculations made from these data are obviously basic factors influencing *calculated rates*. The coverage of data used in the present analysis, and certain corrections applied, have already been outlined (in section B, on method), and it is considered that rates presented here follow quite closely *actual rates* of first admission to public (federal and provincial) mental institutions in Canada. Some of the factors influencing actual first admission rates will now be considered.

2. Social judgment of mental abnormality

As Davis points out (1948), the definition of mental disorder is stated in social terms. Whether the causation of mental abnormality in any given individual is predominantly biological, psychological or socio-cultural, the conclusion that abnormality exists (and any consequent decision regarding appropriate action to be taken) is made by the individual concerned or other members of society. Psychiatrists and other groups may influence (or be influenced by), but do not alone determine, the judgment of the community as a whole. This social judgment of what constitutes mental abnormality varies according to time, place and social group, and may be illustrated by the predominant public attitude towards alcoholism in different countries during recent years.

Höjer (1951) has described three phases in the public care of alcoholics — police care, social care (as through temperance boards and inebriates hostels), and medical care. These phases are represented in greatly varying degrees in different countries of recent years, but there is a tendency to progress from police care towards medical care as the social judgment on alcoholism progresses from regarding it as criminal, sinful or immoral, to considering it as evidence of sickness.

Such a change in social judgment would appear to be largely responsible for the precipitous rise in admissions for alcoholism without psychosis in Canada during the post-war period. The increased first admission rates for other "minor" disorders, and possibly also for certain psychoses, may also be partly attributable to changes in social judgment of what constitutes abnormality.

3. Social demand for mental hospital care

Legislation concerning admission to mental hospitals, and the provision of adequate accommodation, are both the direct outcome (in a democracy) of social demand for mental hospital care. While such social demand may usually closely follow social recognition of what constitutes mental abnormality, this is not always so.

Gruenberg (1950) notes that in the 19th century patients had to be "furious and violent and dangerous" (not merely recognisably abnormal) before the law permitted their hospitalisation, and he comments that the more liberal laws of today might be expected to lead to higher admission rates.

The provision of increased psychiatric facilities, involving building and training programmes sponsored by government, universities and private enterprise, must await assurance that these facilities will be utilised when available.

Such social demand for increased psychiatric facilities may result not only from increased social awareness and recognition of abnormality, but also from growth of vulnerable segments of the population, increasing incidence of certain mental disorders, economic stress, or greater belief in the efficacy of treatment available.

During the period of the present study, changes in attitudes towards and social demand for mental hospital care in Canada may be indicated by the changes in rates for different methods of admission, particularly the greatly increased post-war rates for persons seeking help (in public institutions) voluntarily. While this increased social demand for hospitalisation may be a factor in other diagnoses, it would appear to be of major importance in the progressive rise in rates for the organic psychoses of senility and in the marked post-war increases in rates for the "minor" mental disorders.

4. *Availability of mental hospital accommodation*

Goldhamer and Marshall (1949) draw attention to a study published by Jarvis in 1866 on the "Influence of distance from and nearness to an insane hospital on its use by the people", and note that at that time counties (in Massachusetts) having a mental hospital immediately accessible to them had admission rates double those of other counties. They found that by 1940 this ratio had decreased from approximately 2.0 to 1.13 and they conclude that the "law of distance" still operates today, but with diminished force. Buck, Wanklin and Hobbs (1955) have found that distance from a mental hospital is still an important factor in influencing rates of admission for senile patients.

The influence of availability of hospital accommodation, regardless of distance, is illustrated by the fluctuations in admission rates for mental deficiency, sudden increases in these rates being associated with the opening of new training schools for mental defectives (Wanklin, Buck and Hobbs, 1954). This occurred in the present study in the year 1950. It may be added, however, that, in spite of greatly increased rates of discharge, the post-war increases in rates for the "minor" disorders could probably not have taken place without expansion in hospital accommodation.

5. *Availability of alternative psychiatric facilities*

In recent years a number of general hospital psychiatric units and additional community mental health clinics have been established in Canada (Department of National Health and Welfare, 1954). It has frequently been suggested that the provision of these alternative facilities will tend to reduce the numbers of admissions to mental hospitals.

Experience indicates that the majority of patients hitherto receiving treatment in these settings have psychoneuroses or other "minor" personality disorders—in fact disorders of the same type that have been largely responsible for increased first admission rates to mental hospitals in recent years. In view of recent developments in treatment (particularly current innovations in drug therapy) it is still too early to be sure what effect the provision of these alternative facilities may ultimately have on mental hospital admissions with either major or minor disorders, but it is evident that up to the present time increased public awareness and demand for treatment has exceeded the capacity of community mental health services available.

6. *Diagnostic criteria*

While diagnoses made on patients following admission will not affect aggregate rates of admission, criteria for diagnosis will obviously influence the rates obtained for individual disorders.

In reviewing the literature, Gruenberg (1950) found a great deal of skepticism regarding the validity of psychiatric diagnosis, and expressed the opinion that the only groups that could be consistently distinguished were the mentally defective, epileptic and non-psychotic alcoholics. He quoted a study by Elkind and Doering comparing the diagnoses made on a group of patients in the Boston Psychopathic Hospital (in 1925-1926) with the diagnoses made on the same patients in other hospitals. The changes in diagnosis found in this study between one hospital and another were around 30 per cent, which he noted was about the same order of magnitude as the variation found by Cabot between clinical diagnosis in medicine and autopsy findings.

In a more recent study, Lewis and Pietrowski (1954) investigated diagnoses made 3 to 20 years later on 122 re-admissions initially diagnosed as manic depressive or psychoneurotic. Out of 70 patients earlier considered manic depressive, 38 (or 54 per cent) were subsequently diagnosed schizophrenic, and of 52 patients initially considered psychoneurotic, 24 (or 46 per cent) were later felt to have developed clear cut signs of schizophrenia.

It is apparent that diagnostic criteria vary according to time, place and person, and wide differences in diagnostic policies doubtless existed throughout Canada during the period under analysis. One example of recent change concerns the diagnosis of schizo-affective psychosis, which was made on 77 first admissions throughout Canada in 1950, and increased to 114 in 1951, 180 in 1952 and 224 in 1953. These cases are currently included under the larger group of schizophrenia, but a number would probably have formerly been considered predominantly manic depressive.

In efforts to obviate the effects of diagnostic inconsistency some workers have studied rates for wide diagnostic groups such as "functional", "psychosis with organic disease" and "without psychosis", etc. (e.g. Somner and Harman, 1944; Wanklin, Buck and Hobbs, 1954). In the present investigation, however, it was considered that more detailed information could be obtained by examining selected diagnoses separately. Among the diagnoses selected here, the likelihood of inconsistency is considered least for C.N.S. syphilis, the organic psychoses of senility, alcoholic psychoses, and alcoholism and mental deficiency without psychosis.

7. *Incidence*

In view of the factors already discussed, and the relatively short time span involved, the increases in rates observed in the present study do not contradict the conclusion of Goldhamer and Marshall (vide supra) that there has been no increase in the incidence of the major psychoses of middle life during the past century.

However, although it has been concluded that first admission rates do not reflect incidence alone, and that the factors hitherto considered are at least as important determinants of these rates, incidence remains one of the possible variables involved. While neither a rise nor a fall in the rates for a given diagnosis necessarily indicates a corresponding rise or fall in incidence, even when the direction of change is contrary to current overall trends, certain observations on rates for selected diagnoses do suggest changes in incidence.

In the case of *C.N.S. syphilis*, diagnosis is dependent on the application of objective laboratory investigations, and the rapid decline in first admission rates, progressing from the younger to the older age groups (and also contrary to the overall trends) is considered indicative of a true decline in incidence.

In *schizophrenia*, on the other hand, the considerable rise in rates during recent years (particularly for males aged 20 to 29, and females aged 30 to 39) it felt to be much less suggestive of a true increase in incidence, and may well be wholly attributable to demand for admission of less advanced cases and/or the inclusion in this category of cases formerly diagnosed manic depressive, paranoid or psychoneurotic (vide supra).

Rates for *manic depressive psychoses* and *paranoid states* remained remarkably constant for both sexes and all age groups, which may well reflect consistency of incidence, but it is also possible that increases in incidence could have been masked by the delegation of cases to other diagnostic categories (e.g. schizophrenia, involutional or psychoneurotic), or vice versa.

The diagnosis of *involutional psychoses* increased in females throughout the period studied, and in males particularly during the post-war years, but it is considered that this is much more likely to have resulted from changes in social demand and/or diagnostic criteria than from a true increase in incidence.

Rates for *senile psychoses and psychoses with cerebral ateriosclerosis* decreased in the age group 50 to 59 (probably at least partly due to increasing recognition and diagnosis of functional disorders in this age group), remained fairly constant in the age group 60 to 69, and showed a marked increase for both sexes in the age group 70 and over. The view that similar increases in rates for organic psychoses of senility observed in other trend analyses reflected true increases in incidence was expressed by Dayton (1940, 1943) and Malzberg (1940, 1943). Others, however, have attributed the rising trend in these rates to an increasing tendency to hospitalise persons suffering from mental disorders of the senium, although Goldhamer and Marshall (1949) allow that possibly some of the increase may be due to an actual increase in incidence. The present author considers that such an increase in incidence might logically be expected to result from the prolongation of life by advancing medical techniques, in situations where there has been temporary or lasting impairment of brain metabolism (related to anoxia, nutritional deprivation, etc.—Gregory, 1952). However, the pattern of increasing rates observed in the present study (relatively uniform for males, and most marked for females during the war years) may be taken to favour the influence of increased social awareness and demand for hospitalisation.

For *psychoneuroses* and *psychopathic personality without psychosis*, it has already been postulated that first admission rates probably bear little relation to incidence, and that the marked increases in rates during recent years are indicative rather of changes in social judgment and demand. It may also be added that the possibility of considerable diagnostic inconsistency exists, particularly with early or mild forms of the functional psychoses.

As with psychoneuroses and psychopathic personality, the marked post-war rise in rates for *alcoholism without psychosis* appears to reflect mainly social judgement and demand, in the presence of adequate hospital accommodation, rather than incidence. The rates for *alcoholic psychoses*, however, might be expected to provide a somewhat more reliable index of the incidence of alcoholism as a whole, and these also showed a definite (though less precipitous) increase, comparable in degree to the concurrent increase in consumption of alcoholic beverages. Estimates of the prevalence of alcoholism in Canada based on the Jellinek formula (using reported deaths from cirrhosis of the liver as the primary source of information) show a less marked increase, amounting

to 18.9 per cent from 1946 to 1952 (Popham, 1955), but increases in deaths from cirrhosis might be expected to lag somewhat behind increases in incidence.

While rates for *mental deficiency without psychosis* showed considerable fluctuation during the period studied, there was no appreciable overall rise or fall, which is taken to indicate that probably there has been little variation in incidence, but periodic changes in the availability of hospital accommodation (vide supra). The diagnoses of *psychoses with mental deficiency and with psychopathic personality* showed no such marked fluctuation, but a gradual diminution throughout the period during which they were recorded separately, which may well reflect an increasing tendency to classify these disorders according to the type of psychosis manifested.

8. *Economic stress*

Previous workers have noted that trends in first admission rates tend to bear a relationship to the degree of generalised economic distress as indicated by unemployment (e.g. Wanklin, Buck and Hobbs, 1954). This finding may be related to others showing that rates of mental disorder at a given time increase with decreasing socio-economic status (e.g. Malzberg, 1940; Faris and Dunham, 1940; Redlich et al., 1953).

In the present study a close time relationship between first admission rates and unemployment is observed during the years 1932 to 1945. Not only does the overall trend of admissions tend to rise and fall with unemployment during this period, but also female rates most closely approximate male rates (and in some age groups exceed them) at about the same time that female unemployment exceeds male. Moreover, this fluctuation in rates is not identical for all age groups and diagnoses, being most marked in the middle age groups (particularly for males) and in the diagnoses of mental deficiency and schizophrenia.

It appears probable that the relationship between economic stress and first admission rates is a causal one, but that the effect of economic conditions on rates is indirect and involves at least two of the factors already discussed. Thus social demand for hospitalisation is almost certainly increased by economic stress, and this might be expected to apply particularly to mental defectives and ambulatory schizophrenics. However, it also appears likely that economic stress may effect a prompt increase in incidence, by precipitating or aggravating some functional disorders. A more remote effect on incidence is also conceivable, if economic stress should alter predisposition to some functional disorders by adversely affecting early experience and personality development, but this must remain in the realm of speculation.

9. *War*

It has been stated that the rate of derangement in civilian populations often declines during wartime, apparently due to the mobilization of the citizenery behind a single purpose, giving new meaning and vitality to the common man— whereas in the armed services the rate of mental derangement reaches phenomenal proportions (Davis, 1948).

It is true that previous studies have shown decreased first admission rates to civilian mental hospitals in wartime, and suicide rates have undergone marked declines (particularly for older men) in countries actively participating in a shooting war, although the latter rates have been known to increase during wartime (particularly for women and younger men) in a country occupied by the enemy (Gordon et al., 1952).

In the present study, first admission rates decreased in the middle age groups, particularly for males, but also inclusive of males over age for military service.

The interpretation of the latter observations, however, is probably more complex than the opening statement would imply, and involves consideration of factors already discussed. Thus, while social demand for the hospitalisation of at least certain categories of mental disorders (particularly those rendering the individual non-productive) may be even greater than in peacetime, the provision of new hospital accommodation will necessarily be postponed. While the incidence of certain forms of mental disorder (as illustrated by suicide rates) may diminish, it is established that unemployment does decrease.

10. *Immigration*

It is known from other studies (e.g. Malzberg, 1940; Roberts and Myers, 1954; Wanklin et al., 1955) that rates of certain mental disorders are higher among immigrants (particularly recent immigrants) than the native born, and it has been suggested to the present author that increases in rates observed in this study might be attributable to periods of heavy immigration to Canada.

It is not within the scope of the present investigation to analyse in detail the distribution of mental disorders amongst immigrants, but the question posed above may be answered briefly by reference to percentages of foreign born among first admissions in certain years.

Now the proportion of foreign born in the general population in recent census years was as follows:—1931, 22.3 per cent; 1941, 16.6 per cent; 1951, 14.5 per cent. The proportion of foreign born among first admissions for five significant years was as follows:—1932, 30.8 per cent; 1936, 28.3 per cent; 1941, 25.5 per cent; 1946, 22.4 per cent; 1951, 23.2 per cent.

These figures show consistently higher percentages of foreign born among first admissions than in the general population (though it should be noted that weighting of the immigrant population in the older age groups would tend to result in approximation of age specific and standardized rates for native and foreign born). However, it is evident from the pre-war and wartime fall (with only slight subsequent increase) in the percentage of foreign born among first admissions, that the increases in rates prior to 1937 and subsequent to 1945 cannot be attributed to immigration alone, although the latter may have contributed to increases in some age groups and diagnoses.

It may be added that for the year 1951 (in which 23.2 per cent of all first admissions were foreign born) the percentage of foreign born among certain diagnoses was as follows:—schizophrenia 22 per cent, senile and arteriosclerotic psychoses 41 per cent, psychoneuroses 27 per cent, pathological personality 17 per cent, alcoholism without psychosis 24 per cent. Apart from the organic psychoses of senility, these figures show no disproportionately high representation of immigrants among these diagnoses, and the rapid post-war increase in rates for the milder disorders cannot be attributed to immigration.

11. *Age and sex*

Although obvious differences exist been first admission rates for various age groups and the two sexes, and these differences require analysis wherever possible, they are here mentioned last because they are effects rather than causes of numerous other factors—some of which have been discussed in the study.

Age and sex differences indeed may vary with time and place, and represent the aggregate influences of social judgment, demand for and availability of

psychiatric services, incidence of various forms of mental disorder, etc.—and hence of all the biological, psychological and socio-cultural determinants of mental abnormality.

E.   Summary

First admission rates to Canadian mental hospitals have been analysed by age, sex diagnosis and method of admission, for the years 1932 to 1953 inclusive.

This 22 year period was divided by the war into three periods of approximately equal duration— a pre-war era of high but gradually falling unemployment, the war years, and a post-war period of economic expansion with continued low unemployment.

Overall age standardized rates showed a definite time relationship with figures for unemployment up till the end of the war, but subsequently rose rapidly in the absence of economic stress.

There was a continuous excess of male rates over female in most age groups and diagnoses, but this excess was least or reversed towards the end of the war, when female unemployment exceeded male.

Rates for the youngest age group showed considerable fluctuation, and those for the oldest age group showed an increasing trend throughout the 22 year period. In the intermediate age groups there was a cyclical tendency corresponding with the overall trend, more marked for male than female, and most pronounced for the age group 30 to 39.

Age sex specific rates for thirteen selected diagnoses, and their estimated yearly trends, have been examined.

Rates for C.N.S. syphilis underwent a marked decline, particularly in the post-war period.   Rates for psychoses with mental deficiency and with psychopathic personality also showed slight decreases.   Manic depressive psychosis and paranoid states maintained relatively stable rates, while mental deficiency without psychosis showed considerable fluctuation but no overall change.   Rates for the organic psychoses of senility increased throughout (for the age group 70 years and over), while rates for the remaining diagnoses all increased during the post-war period, alcoholism without psychosis showing the most rapid rise.

Rates for admission on medical certificates showed relative equality between the sexes and tended to follow the overall trend up till the end of the war, but the post-war increase was less marked and less consistent than that for the overall rates.   Voluntary rates remained fairly constant until the last five years of the study and then increased rapidly.   Rates for admission on warrant showed a consistent male predominance, with slight initial increases followed by declines to lower levels than initially, although male rates showed slight upward movement at the end of the period under examination.

It has been concluded that first admission rates do not simply reflect either the incidence of individual diagnoses or the aggregate incidence of all mental disorders, but that a number of factors influence these rates.

The influence of the following factors on first admission rates has been discussed:—(i) reliability of data and calculations, (ii) social judgement of mental abnormality, (iii) social demand for mental hospital care, (iv) availability of mental hospital accommodation, (v) availability of alternative psychiatric facilities, (vi) diagnostic criteria, (vii) incidence, (viii) economic stress, (ix) war, (x) immigration, (xi) age and sex.

It has been concluded that the marked post-war increases in rates for "minor" disorders (psychoneuroses, psychopathic personality and alcoholism without psychosis) is largely attributable to increased social awareness and demand, in the presence of available accommodation.

While the decline in rates for C.N.S. syphilis apparently represents a true decline in incidence, the multiplicity of factors influencing these rates renders it impossible to attribute observed increases in rates to definite increases in incidence. However, some increase in incidence is considered probable for alcoholism and alcoholic psychoses, and possible for certain other diagnoses (e.g. schizophrenia and the organic psychoses of senility).

The influence of economic stress, war and immigration upon rates would appear to be complex, involving particularly consideration of both social demand and incidence, while age and sex distribution represent the product of all other factors affecting first admission rates.

Résumé

Le taux des premières admissions aux hôpitaux mentaux canadiens fut analysé en rapport avec l'âge, le sexe, le diagnostic et le mode d'admission pour les années 1932-1953 inclusivement.

La guere divisa cette période de 22 ans en trois périodes de durée approximativement égale—une période d'avant-guerre de chomage élevé mais allant progressivement en diminuant, les années de guerre, enfin une période d'après-guerre d'expansion économique sans chute appréciable de l'embauchage.

Les taux standardisés moyens indiquent une relation définie avec la sévérité du chomage jusqu'à la fin de la guerre, mais par la suite ils s'élèvent rapidement en l'absence de crise économique.

Le taux pour les hommes fut continuellement supérieur à celui des femmes dans la plupart des groupements d'âge et de diagnostic. Ce chiffre supérieur diminua ou s'inversa vers la fin de la guerre alors que le chomage feminin excéda celui des hommes.

Le groupe des plus jeunes fluctua considérablement et le groupe des plus âgés révéla une tendance à la hausse durant cette période de 22 ans. Les groupes d'âge intermédiaire montrèrent une allure cyclique, correspondant à la tendance générale, plus marquée chez les hommes que chez les femmes et plus prononcée pour le groupe de 30 à 39 ans.

On examina spécifiquement les taux par rapport à l'âge et au sexe pour treize différents diagnostics et on estima leur comportement annuel.

Le taux de la syphilis nerveuse enregistre une diminution marquée, surtout dans les années d'après guerre. Les taux de psychoses chez les déficients mentaux et chez les personalités psychopathiques affichent aussi une légère diminution. La pychose maniaco-dépressive et les états paranoides conservent un taux relativement stable, alors que la déficience mentale sans psychose présente une fluctuation importante sans altération du taux général. Le taux des psychoses organiques de la sénilité augmente durant toute la période (pour le groupe de 70 ans et plus), alors que celui des autres entités organiques s'élève durant la période d'après guerre seulement, l'alcoolisme sans psychose montrant la plus forte augmentation.

Le taux des admissions avec certificat médical montre une égalité relative des deux sexes et suit la tendance générale à la hausse jusqu'à la fin de la guerre, mais l'augmentation d'après-guerre présente une ascension moins rapide et moins continue que la tendance générale. Les admissions volontaires demeurent passablement constantes jusqu'aux dernières cinq années de l'étude et par la suite

augmentent rapidement. Les admissions avec mandat montrent une prédominance constante des hommes, avec augmentations initiales légères suivies de récessions. Cependant le taux pour les hommes affiche une augmentation légère à la fin de la période examinée.

Le taux des premières admissions, conclut-on, ne dépend pas seulement des diagnostics individuels ou de l'incidence agglomérée de tous les troubles mentaux, mais d'un certain nombre de facteurs.

On discuta de l'influence des facteurs suivants sur le taux des premières hospitalisations: 1° l'exactitude des données et calculs; 2° le judgment social d'une anomalie mentale; 3° l'amplitude de la demande pour soins dans les hôpitaux mentaux; 4° les disponibilités d'hospitalisation; 5° à défaut des disponibilités, attention psychiatrique alternative; 6° les critères diagnostiques; 7° la fréquence; 8° la situation économique (economic stress); 9° l'état de guerre; 10° l'immigration; 11° l'âge et le sexe.

On en vient à la conclusion que l'augmentation marquée d'après guerre de taux des troubles "mineurs" (psychonévroses, personnalité psychopathique et alcoolisme sans psychose) est due en grande partie à une prise de conscience sociale et à des exigences accrues, en présence de possibilité d'attention psychiatrique.

Alors que la chute du taux de la syphilis nerveuse représente apparemment un véritable déclin de la fréquence, la multitude des facteurs influençant ces différents taux rend impossible l'attribution des augmentations observées à des augmentations définies de fréquence. Cependant de simples augmentations de fréquence semblent probables pour l'alcoolisme et les psychoses alcooliques et possibles pour certains autres diagnostics (e.g. schizophrénie et les psychoses organiques de la sénilité).

L'influence des difficultés économiques, de la guerre et de l'immigration, sur les taux apparaît complexe, comprenant particulièrement une considération de la demande sociale et de la fréquence, alors que la distribution par âge et sexe représente le produit de facteurs affectant le taux des premières admissions.

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Correction: It is regretted that in the paper entitled "Clinical investigation of Azocyclonol Hydrochloride" the name of the joint author with Dr. G. J. Sarwer-Foner was incorrectly spelt—it should read E. K. Koranyi, M.D.

STUDIES ON THE PHYSIOLOGY OF AWARENESS:
CONATIVE INSUFFICIENCY IN PSYCHIATRIC PATIENTS*

John W. Lovett Doust, M.B. and Laura I. M. Coleman, M.D.†

It was Francis Aveling's (e.g. 1929) effort especially which separated the concept of conation from the will or volition of the older psychologies. Conation is the tendency to movement, the blind striving underlying the more purposefully-directed striving of specific instincts or drives, the driving force or energy of the organism; it lies behind the "libidinal urge" of psychodynamics, behind motivation and behind biological and psychic "energies". As such, it has been considered by some writers (e.g. Nielsen and Thompson, 1947) as the "most fundamental of all cerebral functions."

Relative conative insufficiency is seen as part of the personality spectrum of healthy individuals, the sluggish, lazy, ineffectual person contrasting with the tense and restless energy of the driving ambitious executive. It is seen in certain neurological diseases (e.g. Wernicke's encephalopathy and akinetic mutism) in which lesions of the periaquaductal gray matter have occurred (Bailey and Davis, 1942; 1945). It is seen also in psychiatric disorders, conative poles being seen at their extremes in mania and benign depressive stupor.

Conation also lies behind consciousness. In Miller's (1942) semantic analysis, unlearned "instinctual" behaviour is a mode of relative unconsciousness but in man awareness of this aspect of personality is at any rate partially self-evident and an individual can compare his own drive and insightful ability for striving with those of others. An even more definite relationship of consciousness to the notion of "conating, striving, tending, inclining towards an end" (Aveling, 1926) is given by Aveling himself. He writes (Aveling, 1926) of the goal of the "self-willing-and-striving" that the awareness of this relational experience is "no consciousness of *mere* relation but the full-blooded, if elusive, consciousness of the Self-acting-in-some-determinate-way. In this consciousness two terms, or fundaments, and a causal relation are insightfully cognised."

A series of essays have already been made toward an attempt to define and quantify the parameters of awareness (Lovett Doust and Coleman, 1955; Lovett Doust et al., 1953; Lovett Doust and Webb, 1955; Lovett Doust and Salna, 1955; Lovett Doust and Schneider, 1955). The "elusiveness" of the parameter of conative awareness makes it desirable to determine it by inference from the results of goal achievement and it is properly with attempts at the measurement of relative conative ability therefore that this report is concerned.

Procedure and Methods

A total of 662 adults was available for testing. This population consisted of two samples of 272 healthy controls of which one comprised 153 British Army conscripts, hospital personnel and business men, and the other 119 undergraduates of both sexes of a Canadian University. The remainder of the population consisted of 11 patients with severe migrainous headaches, 83 hospitalized or delinquent and imprisoned psychopaths, 16 idiopathic epileptics, 91 cases of affective disorder—depression, 92 neurotics, 85 schizophrenics and 12 patients with organic reaction type syndromes (presenile dementia, myxoedema with psychosis, Korsakow's psychosis and cerebral arteriosclerosis). Ages ranged from 17 to 48 years and the sex ratio was approximately unity.

The test procedures were selected to express the concept of conation. In the first a modification of Kraepelin's tapping test was employed. The subject (S) was given a clean sheet of quarto-sized paper and a pencil. The experimenter (E) instructed him that, when given the word to start, he was to tap on the paper with the point of the pencil as quickly as possible, making a mark each time but not going over the same spot twice. The instruction about going as quickly as possible was then repeated and S. told to start tapping. Duration was timed with a stopwatch and an interval of exactly 15-seconds permitted before the maximal rate tapping was stopped. To control the variable of differing laterality, S. was then told to transfer the pencil to his other hand, a second piece of paper was provided and the instructions and the test were repeated. The test was scored by summing the dots executed by the two hands during the 30-sec. total period.

The second procedure concerned the estimation of maximal breath holding time (BHT). Of the several methods available of doing this most were discarded because they involved other variables as well as BHT. (An example of one of these is the Flack test wherein the weight of the mercury column seriously affects the results). For our investigation a mica-mounted platinum wire grid was built into the evacuated canister of a standard civilian-duty type chemical warfare respirator. The grid was so wound that it acted as the fourth resistance of a balanced bridge-circuit. A milliammeter was placed across the bridge and the latter energized by a suitable current, which also had the effect of heating slightly the platinum wire grid. Adjustment of a variable resistance incorporated in the circuit balanced the bridge in the null position and any attempt at breathing by the masked S. would then have the immediate effect of cooling the grid, unbalancing the bridge and causing a deflection of the meter. Ample time was invested in instructing the S. as to what was required of him and in accustoming him to wearing the respirator. For the test, S. was told to stop breathing at the time E. noted was the mid-point of inspiration and he was asked to preserve the apnoea for as long as he was able. At least three trial runs were used, E. encouraging S. after each effort. Three test runs were then made, S. being urged after the first two to try and beat his previous score. Maximal breath holding time was taken to be the highest score attained during the three test runs.

Results

Tapping Test. Table 1 shows the scatter of the mean summed scores among the various groups of Ss. tested. The highest score is given by the Controls and the lowest (with the greatest SD) by the schizophrenics. Table 2 examines the variables of age, sex and culture. Although statistically insignificant the tendency for the scores to increase with increasing age is interesting from a developmental point of view.

Breath-holding test. Table 3 analyses the scatter of BHT results by diagnosis and suggests a rather similar rank order to the tapping test scores. Table 4 suggests that a similar developmental tendency is present also and that this might have achieved significance had more control subjects been available for testing.

Validation of the decision involved in selecting these two test-procedures as measures of the single variable of conation was sought by testing the extent of their association. A Pearson product moment correlation coefficient was run on the two sets of data for all groups of Ss. available. It was found that r was $+.545$; t was 10.138 and that, with a d.f. of 243, the correlation was statistically highly significant ($P > .001$).

Discussion

Conation has been localized as represented neurophysiologically at three hierarchical levels in the central nervous system structure (Nielsen and Thompson, 1947). These are a basal one, the periaquaductal gray matter of the midbrain; a thalamic one, the ventrolateral nucleus; and a cortical level, the pre– and post-central gyri of the fissure of Rolando. Only speculative information is available as to the topographic localization of the disturbances characterizing psychiatric disorders and it would seem certain that such disturbances are physiological and potentially reversible in contradistinction to most neurological "organically" determined disorders of conation. Notwithstanding this, a hierarchical concept of levels of conative representation does provide an explanation for the very different manifestations of conative insufficiency seen, e.g., in benign depressive stupor and the stupor of the catatonic schizophrenic patient; in the listless anergy of the vacuous dement and that in the case of *dementia praecox simplex;* and the types of inadequacy and ineffectiveness outstanding on the one hand in certain psychopaths, and, on the other, in some hysterics. In these and many other psychiatric syndromes conative disturbances would appear not only closely integrated with the disease but may also prove to be its constitutional basis. The simple tests of conative ability employed here emphasize the widespread nature of this insufficiency in the major patterns of psychiatric disease. If we are justified in thinking that they are truly tests of the striving, driving, tendency-to-move and seek-for-a-goal activity which is conation, then our findings appear to furnish a means of expressing this concept in measurable terms.

The special case of neurosis is interesting and deserves one final word. The neurological disturbance in neurosis is a functional one and almost certainly is confined to the cortical neurengrammes. Our test results suggest a significant conative insufficiency by comparison with those of healthy controls. Among psychologists, Webb's factor W (Webb, 1915; Brogden, 1940) or "strength of will power", Pavlov's (1941) "strength of nervous functioning", Babcock's (1941; 1944) "efficiency" as opposed to ability, the "goal-discrepancy score" of level of aspiration tests (Lewin *et al.*, 1944), the f or "fluency' factor of personal tempo (in connexion with which much work on variations of the Kraepelin tapping test has been concerned), Eysenck's (1947) concept of "neuroticism", and many others have educed factors characterizing neurosis which would seem grounded firmly in conative insufficiency. Eysenck (1947, p. 261) states this explicitly in the conclusion he draws from his extensive experimental study. He writes: "Much of the evidence appears to favour a view which would stress an explanation or description of neuroticism in terms of the *conative* component of personality."

Summary

(1) The concept of conation is described and its role as a parameter of awareness is discussed.

(2) A modified maximal speed Kraepelin tapping test and a method of estimating total breath holding time were selected to measure conative sufficiency in 272 healthy controls, 11 migrainous and 379 psychiatric patients.

(3) The tests correlated significantly with each other and, in both, the highest scores were found among the control groups, the lowest among the organic reaction types and schizophrenics while those of the other diagnostic groups lay between these two extremes.

(4) Among the possible variables investigated, that of age was suggestive of a tendency to conative development.

(5) The place of conation in the determination of psychiatric breakdown is discussed, with especial reference to neurosis.

TABLE 1: Summed dot scores of a 30-sec. Kraepelin tapping test in psychiatric patients

Group	N	Mean Summed Score	s	Test of Significance
Controls	153	179.810	23.324	
Migraine	11	175.273	21.689	
Psychopathy	83	172.976	25.067	F ratio = 13.303
Epilepsy	16	168.938	40.016	
Depression	91	165.242	32.254	d.f. = 7 and 535
Neurosis	92	164.609	30.529	P < .001
Organics	12	147.500	43.137	
Schizophrenia	85	137.941	53.961	

TABLE 2: Significance of some of the variables involved in Table 1

Group	N	Mean Sum of Tapping Test	s	Test of Significance
AGE (years)				F ratio = 1.251
To 19	52	172.962	23.884	d.f. 3 and 267
20–29	173	179.035	23.443	P is N.S.
30–39	42	174.310	26.229	
40 and up	4	185.500	13.723	
SEX				t = 0.620
Canad. males	46	175.065	29.792	d.f. = 117
Canad. females	73	173.466	20.329	P. is N.S.
CULTURE, ETC.				t = 2.628
Brit. male controls	153	179.810	23.324	d.f. 197
Canad. male controls	46	175.065	29.792	P = .01

TABLE 3: Maximal breath holding time (BHT) in psychiatric patients

Group	N	Mean BHT (secs.)	s	Test of Significance
Healthy Controls	93	33.121	19.346	
Neurotics	63	24.746	13.475	F ratio = 13.997
Depressives	25	19.440	13.364	
Schizophrenics	43	11.023	10.769	d.f. = 5 and 232
Epileptics	3	27.000	19.089	
Organic reaction	5	6.200	5.541	P < .001

TABLE 4: The influence of age on maximal breath holding time (BHT) — Control group

Age (Years)	N	Mean BHT (secs.)	s	Test of Significance
19 and under	12	27.583	15.739	F ratio = 2.123
20–29	59	32.169	18.831	d.f. = 3 and 95
30–39	26	35.577	19.564	P is N.S.
40 and over	2	62.500	38.891	

Résumé

1) Le concept de conation est discuté ainsi que son rôle comme paramètre de la conscience, faculté d'éveil.

2) Une version modifiée d'un test de vitesse maxima de Kraepelin et une méthode mesurant le temps de retenue de la respiration furent choisies pour évaluer le pouvoir de conation chez 272 individus-contrôle normaux, chez 11 migraineux et chez 379 patients psychiatriques.

3) On obtint une corrélation significative des tests entre eux; les pointages les plus élevés furent obtenus chez les groupes-contrôle, les moins élevés chez les organiques et les schizophrènes. Les autres groupes-diagnostic se situaient entre ces deux extrêmes.

4) Dans l'étude des différentes variables, l'âge apparut un facteur favorisant le développement du pouvoir conatif.

5) Discussion du rôle de la conation dans le développement des troubles psychiatriques, principalement des névroses.

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PHYSIOLOGICAL CORRELATES OF INTELLIGENCE

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This study was undertaken to determine the relationship of intelligence to the physiological response to atropine, in a series of eighty mental defectives.

An attempt is made to assess these findings in terms of psychodynamic evolution.

Theoretical considerations

In 1954, investigation of atropine responses showed their peculiarity in schizophrenics as compared with neurotic and depressive subjects (Hoffer, 1954). This author, in the same year, went on to establish a diagnostic test for likely schizophrenic populations on the basis of that work.

It was thought worthwhile to assess the atropine responses of two groups of mental defectives, differing as far as possible in their mean I.Q., in order to determine any possible correlation between I.Q. and the physiological concomitants of schizophrenia.

Lack of intelligible communication in mental defectives of the lower grades is a particular stumbling-block to accurate psychodynamic investigation. It has seemed to us more profitable to assess the condition of these patients as far as possible in physiological terms, which might be re-translated psychopathologically.

Case selection.

The eighty patients were assessed in four groups, as follows:

Group	No. of Cases	Mean Age in Years	Mean I.Q.
1.	19	10.4	32.2
2.	21	10.0	62.4
3.	27	21.2	30.1
4.	13	19.6	61.3

Epileptics, and patients with evidence of organic brain lesions, were excluded from the present series.

Technique

The physiological analysis is based on the response to 3mgm. atropine sulphate, injected intra-muscularly at 9.30 a.m. Systolic blood pressure, oral temperature, eosinophils, neutrophils, monocytes, and lymphocytes, are compared before and after the atropine injection, the second leucocyte count being taken two hours after the injection. Hoffer's original technique is modified slightly to the extent that eosinophil counts are made from the differential smear, rather than by the Randolph method of counting which he employed.

Schizophrenic-type responses are indicated by a fall in blood pressure, temperature, and neutrophils, and/or a rise in eosinophils, monocytes, and lymphocytes, with certain allowances as described by Hoffer.

Hoffer applies a scoring system to weight the results: four points, for a schizophrenic-type response of blood pressure; two points each, for neutrophils and eosinophils; one point each, for the remaining responses. As this is an

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interim report on our first eighty cases, we are concerned with comparison of responses between our four groups rather than with statistically-significant total scores, which must await completion of the survey.

In the ensuing tables are considered: In Table 1, the mean basic findings for our groups, prior to atropine injection; Table 2, the frequency of schizo-phrenic-type responses per group; Table 3, the mean intensity of schizophrenic-type responses per group; Table 4, the mean intensity of non-schizophrenic responses per group.

Mean basic findings

TABLE 1

Group	B.P.	Temp.	Eos.	Neut.	Mono.	Lympho.
1.	105.30	97.75	39.7	540.5	19.9	399.3
2.	106.35	98.53	28.6	527.9	22.7	418.7
3.	126.45	97.95	29.4	568.1	17.4	385.1
4.	120.71	98.11	27.7	553.3	24.7	394.0

The capital headings represent blood pressure, temperature, eosinophils, neutrophils, monocytes, and lymphocytes. These readings are the mean for each group prior to atropine injection, and the differential cell counts, counted from 300 leucocytes, are multiplied by 10/3 to represent the behaviour of a thousand cells.

It will be noted that the high-grade groups (2 and 4) show lower eosinophil and neutrophil counts, higher monocyte, lymphocyte, and temperature readings, for both age-groups. Blood pressure readings, which are slightly higher among high-grade children (group 2), than among their low-grade counterparts, show the converse in adult life.

Frequency of schizophrenic-type responses in percent

TABLE 2

Group	B.P.	Temp.	Eos.	Neut.	Mono.	Lympho.
1.	57.8(11)	52.6(10)	78.9(15)	57.8(11)	89.4(17)	63.2(12)
2.	42.3(9)	42.3(9)	57.7(12)	19.2(4)	61.5(13)	57.7(12)
3.	89.3(24)	33.3(9)	78.6(21)	29.6(8)	78.6(21)	33.3(9)
4.	53.8(7)	30.8(4)	53.8(7)	46.2(6)	61.5(8)	46.2(6)

Percentage figures are followed by the actual number of cases, in the above table. We note that the frequency of schizophrenic-type neutrophil response is halved, approximately, between childhood and young adult life, in the case of low-grades; whereas it is doubled in this time in the case of high-grade defectives. This phenomenon of neutrophilic reversal in frequency is observed to a less marked extent with lymphocyte and temperature responses among low-grades.

The sum of frequencies for the low-grade groups (1 and 3) is far in excess of that for the high-grade groups (2 and 4), and the excess becomes more particularly marked with age in respect of schizophrenic-type blood pressure responses.

Mean intensity of schizophrenic-type responses

<div align="center">TABLE 3</div>

Group	B.P.	Temp.	Eos.	Neut.	Mono.	Lympho.
1.	7.66	0.30	11.53	28.82	10.3	14.1
2.	5.51	0.256	5.6	87.6	8.42	15.13
3.	6.15	0.71	15.36	55.6	6.64	33.5
4.	6.59	0.23	2.4	39.5	8.16	38.0

The above table represents the absolute deviation of schizophrenic-type responses from the initial basal value, and the blood cell variations are in terms of a total leucocyte field of 1,000 cells.

We note that the neutrophilic reversal phenomenon is here inverted: mean intensity of schizophrenic-type neutrophil responses has doubled among low-grades between childhood and young adult life, while it is more than halved in that time in the case of high-grade defectives. Temperature and lymphocyte responses follow suit in the low-grade groups, but the pattern is not borne out among high-grades.

The sum of intensities for each group shows that group intensity is actually greater among high-grade children than among low-grade. It diminishes markedly with adult life, however, while increasing among low-grades in that time; so that the group intensity of adult low-grades is much in excess of that for high-grade patients. Furthermore, the increase in group intensity among low-grades is almost exactly equal to the decrease occurring among high-grades. These group variations, as can be seen, are mainly dependent on neutrophilic and lymphocytic reversal phenomena.

The variations are shown structurally in Figure 1, which is a reconstruction of the results in table 3 ploted along the diagonals of a hexagon whose centre-point is shown. B, T, E, N, M, and L, mark the intensity of schizophrenic-type responses corresponding to blood pressure, temperature, eosinophils, neutrophils, monocytes, and lymphocytes, for the four groups under consideration. The marked divergence of the low and high-grade groups with age is brought out, there being a 'shift to the right' in high-grade patients, with the converse occurring among low-grades:
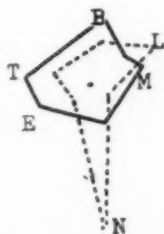
Aet. 10 (approx.)   *Aet.* 20 (approx.)
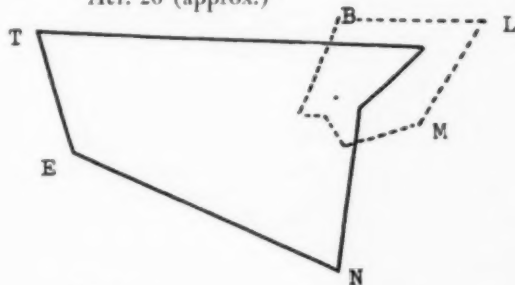
<div align="center">Figure 1.</div>

(The continuous line figures represent the low-grade responses for both ages; the dotted line figures represent the high-grade groups. Neutrophil and lmphocyte reversals are plainly illustrated.)

Mean intensity of non-schizophrenic responses

TABLE 4

Group	B.P.	Temp.	Eas.	Neut.	Mono.	Lympho.
1.	4.50	0.50	22.75	159.4	25.0	178.57
2.	5.79	0.29	22.2	73.3	18.85	112.27
3.	9.37	0.44	15.8	55.75	16.8	114.7
4.	5.71	0.15	21.0	135.4	17.66	126.8

Once more, we note neutrophilic reversal occurring in both low and high-grade categories between childhood and young adult life, and to a less extent in the lymphocyte responses.

Following these changes, the group intensity of non-schizophrenic response is markedly increased between childhood and maturity, in the high-grade groups, while there is a sharp drop in the same period among low-grade patients. This is the converse of our findings in respect of schizophrenic-type intensity of responses, mentioned above.

Discussion

It is apparent from the foregoing that there are marked and definite distinctions in the responses to atropine of mental defectives of low imbecile I.Q. (approx. 30), and those of mid-moron grade (I.Q. 60, approx.).

The schizophrenic type of response is more frequent in the low-grade groups, and increases in intensity over the period of adolescence; while in the same period the intensity of non-schizophrenic response diminishes markedly. The converse is true of the higher-grade groups.

The 'shift to the right' noted in Figure 1 illustrating intensity of schizophrenic-type response appears significant in marking a developmental schism in respect of low and high-grade defectives. No claim is made to establish the absolute measurements of this shift here. However, since the overwhelming frequency and intensity of schizophrenic-type response is present among adult low-grades, we can presume that a therapeutic event occurs in the adolescence of high-grade defectives (themselves originally showing strong intensity of schizophrenic-type responses), and which has no counterpart in the majority of the low-grade group.

Elsewhere, we have commented on the incidence of psychopathy and character disorder in the higher grades, as opposed to the frequency of psychotic syndromes in a follow-up of the life-histories of low-grade defectives (Grant, 1956). As there is evidently a common nucleus in the childhood of mental defectives which shows schizophrenic-type responses, it seems proper to infer that the psychopathy of the higher-grade defective is in effect the scar tissue of his successful combat with schizophrenic tendencies.

Common features of both schizophrenic and psychopathy patients are an impaired ability to form stable relationships, and a self-conception of solitariness which cannot be long relieved.

Bourne (1955) infers from clinical and sociological studies a failure of integration of the ego, in defective children, a condition he terms 'protophrenia'. The weakness of this argument lies in the vague conception of what is implied by 'integration'.

The phenomena we have been studying in the present work point to the 'therapeutic event' as a rallying of the organism towards coping with external

reality, and can be seen most obviously in the re-animation of neutrophils and lymphocytes so that they present a more healthy response to the atropine stimulus. This is tantamount to an extroversion of stress response, if we include all the responses tested as indicative of the powers of adaptive function. Persistent stress, as Selye mentions, involves the organism in adreno-corticoid mechanisms, rather than the adrenaline response to more acute situations (Selye, 1957). Sympathetic hypo-function may be explicable on this basis, in our cases.

Even in those who never achieve such extroversion, however, there is a very definite response occurs, which is of schizophrenic type. It is therefore incorrect to regard the organism as never having achieved any cohesive response-pattern, and the term 'protophrenia' seems to us misleading. Rather, it can be seen that there is a marked deterioration with age in the mean responses of the low-grade group, and this process is, more likely, a true schizophrenic progression.

Since these cases, then, represent a developmental malady of the mind, characterised by inadequate improvement on pre-existing schizophrenic tendencies, bearing with it the dual possibilities of adult schizophrenia and psychopathy, and accompanied by intellectual impairment, some such nomenclature as 'schizopathy' might seem valid to distinguish the syndrome from other psychiatric conditions of childhood.

It is well-known that the average child displays frequent evidence of schizophrenic traits, in his pre-occupation with fantasy-life, self-interest, and the occurrence of neologisms, etc. (Wildermuth, 1923; Despert, 1940; Cappon, 1953). To this extent, it seems likely that the process of healthy mental growth from the time of birth, at least, may be a weaning way from the schizophrenic state of the primitive mentality.

The average child, despite occasional reversion to schizophrenic attitudes, would seem salved from the pathological groups we are discussing by his capability for affectionate relationships. Flattening of affect does not occur as a permanent phenomenon. This, in turn, maintains his potentiality for a significant appreciation of external reality, evidenced in the changes we have seen here among the less severe grades of mental defective.

The crux of the matter in this respect is the 'meaningfulnes'—the significance —of external events for the child, and this is surely based on his ability to respond emotionally to them. Persistence of schizophrenic tendencies would militate against this ability, and appears to be a factor in the responses of mental defectives in this series.

Further work is necessary to amplify these possibilities which have been raised from our interim data.

Conclusion

1. More low-grade mental defective children exhibit schizophrenic-type responses to atropine than do those of high-grade, in terms of blood pressure, temperature, and leucocyte responses.

2. The higher grade children who do show abnormal responses exhibit them much more intensely than do low-grades, and the intensity of non-schizophrenic response is less in the high-grade group at this age.

3. An exact reversal of this situation has occurred by the time young adult life is reached.

4. In all groups, this reversal is strongly pointed by a neutrophilic reversal of response accompanying the changes.

5. It is considered that these changes may underline a common schizophrenic basis to mental deficiency in childhood in the cases under investigation,

which is diverted into psychopathy among the moron categories, while the majority of the low-grade group persist in a state of schizophrenic progression. It is suggested that the designation 'schizopathy' be conveniently applied to this syndrome.

Summary

An interim report is presented illustrating differences in physiological response to atropine among mental defectives of low and high-grade intelligence. Epileptics, and patients with evidence of organic brain lesions, were excluded from the series.

Certain types of response common in schizophrenics occur more frequently among the low-grade defectives, and show increasing intensity over the period of adolescence, while the converse is true of high-grade groups.

A concept of 'inadequate improvement on pre-existing schizophrenic tendencies' is postulated as a factor in determining the degree of intellectual deficiency in mental defectives of this series.

A speculative attempt is made to reconcile this finding with our current knowledge of mental growth in childhood, and is advanced as a possible line of thought for further research.

Résumé

Utilisant le test à l'atropine tel qu'élaboré par Hoffer en 1954, l'auteur entreprend de déterminer les relations entre le degré d'intelligence et la réponse physiologique à l'atropine chez quatre-vingts débiles mentaux. Ses résultats groupés en quatre tableaux lui premettent de déduire des données qui sont résumées dans ses conclusions.

1. Les débiles mentaux de niveau inférieur montrent plus souvent des réponses de type schizophrénique à l'atropine que ceux de niveau élevé considérant les variations de pression artérielle, température et leucocytes.
2. Les enfants de niveau supérieur qui présentent des réponses anormales le font d'une façon beaucoup plus intense que les enfants de niveau inférieur et l'intensité des réponses non-schizophréniques est moins importante dans le groupe de niveau supérieur.
3. Une inversion exacte de cette situation survient lorsque les sujets de la réponse neutrophile.
4. Dans tous les groupes, cette inversion est indiquée par une forte inversion de la réponse neutrophile.
5. L'auteur considère que ces changements reconnaissent un caractère schizophrénique à la déficience mentale durant l'enfance dans les cas investigation, lequel caractère schizophénique se transforme en caractère psychopatique chez les morons, alors que la majorité des débiles inférieurs évoluent vers un état schizophrénique. On suggère de nommer ce syndrome "schizopathie".

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